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BUREAU OF PUBLIC ROADS

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DIGEST OF REPORT ON CONNECTICUT TRAFFIC SURVEY

Reported by L. E. PEABODY, Senior Highway Economist, Division of Highway Transport, Bureau of Public Roads

THE Connecticut traffic survey was conducted under a cooperative agreement between the Bureau of Public Roads and the State Highway Department of Connecticut.[1] The survey was begun October 6, 1933, and was completed September 30, 1934.

CONNECTICUT IS DENSELY POPULATED AND HAS HEAVY TRAFFIC ON ITS HIGHWAYS

Connecticut's population increased 16.4 percent between the censuses of 1920 and 1930. The State is one of four in which all counties had population increases during these years. In 1930 its population density was 333.4 persons per square mile, or more than eight times the population density in the United States as a whole.

The number of motor vehicles registered in Connecticut increased steadily until 1932, the first year to show a decline. This was followed by a smaller decrease in 1933, and in 1934 the losses in registration in the 2 previous years were more than made up when nearly 358,000 motor vehicles were registered, the greatest number in the history of the State.

Gasoline consumption in Connecticut has followed an upward trend except for the year 1932 when there was a decrease of 2.2 million gallons, or 1 percent. In 1934 the consumption was almost 249 million gallons, an increase of 239 percent since 1922.

Traffic on Connecticut highways is composed of many foreign vehicles owing to the geographical position of the State. Surrounded by the heavily populated States of New York, Massachusetts, and Rhode Island, it is in a position where traffic arteries must be provided for many vehicles originating at and destined to points beyond its borders, and must provide as well for the free movement of its own vehicles. Near the southwestern extremity of Connecticut is New York City, with a population of approximately 7 million people; to the north is Massachusetts with a population in excess of 4 million, of which nearly 1 million are concentrated in the Boston area; and to the east is Rhode Island, with a population of approximately 700,000.

There are 11,943 miles of highway in Connecticut, exclusive of city streets. The State highway system covers a total of 2,206 miles, of which 1,019 miles are also on the Federal-aid system. All trunk-line and State-aid roads, which compose the State highway system, are under the direct jurisdiction of the State highway department; for the former the State pays the entire cost of construction, while for the latter the State pays a part of the construction cost. All other rural roads are under the jurisdiction of the towns.

SELECTION AND OPERATION OF SURVEY STATIONS DESCRIBED

The traffic survey covered a major portion of the trunk-line system and a number of State-aid roads. Survey stations were situated only on State or United States routes, but, where intersecting town roads or city streets could be covered along with the principal route, traffic data for such were included in the final tabulations.

Recording stations were located at 156 strategic traffic control points throughout the State where traffic density counts were obtained on the average more than once a month. The locations of these stations are shown in figure 1. The positions of all survey stations were selected in advance of field operations by the State highway department in cooperation with a representative of the Bureau of Public Roads. Each station location was assigned a number by which it may be identified in this report.

Vehicles were recorded at all stations as either Connecticut or foreign and as passenger cars, trucks, and busses. Traffic counts were made at each station for a continuous 8-hour period on a staggered-hour plan alternating from 6 a. m. to 2 p. m. and from 2 p. m. to 10 p. m. in accordance with a schedule covering a full year's work. Sufficient counts were made from 10 p. m. to 6 a. m. to adjust all records to a 24-hour day, and the data are presented on a 24-hour basis.

The data obtained are presented in the flow diagrams, figures 2, 3, 4, and 5. Figure 2 shows the average daily density of all vehicular traffic by the inner stippled band and the average maximum traffic over the same section by the outer band. At intermediate points between or beyond stations approximate density data for each class of traffic may be obtained by scaling the particular band and converting to the number of vehicles by scale on the figure. For routes having light traffic densities it was impracticable to construct flow bands, therefore, their values are represented by line symbols.

Figure 3 illustrates the average density of truck traffic on the same sections of highway; figure 4 shows the average density of bus traffic; and figure 5 shows the average density of foreign vehicular traffic. For simplicity only major cities and intersections are shown, and where a route has both a State and a United States number only the United States marking is given. Table 1 shows the distribution of the traffic between foreign and State vehicles and according to classes of vehicles.

TABLE 1.—*Classification of traffic by type of vehicle and place of registration*

	Passenger cars	Trucks	Busses [1]	Total
	Percent	*Percent*	*Percent*	*Percent*
Connecticut vehicles	84.3	13.9	1.8	100
Foreign vehicles	89.7	10.2	.1	100
All vehicles	85.5	13.1	1.4	100
Connecticut vehicles	76.3	82.3	99.4	77.4
Foreign vehicles	23.7	17.7	.6	22.6
Total	100.0	100.0	100.0	100.0

[1] All busses making regular trips in State were required to carry Connecticut tags and were recorded as Connecticut vehicles.

An overwhelming proportion of bus traffic was of Connecticut registration (99.4 percent). This results

[1] The full report prepared by the Bureau has been submitted to the Connecticut highway department and will not be published or distributed by the Bureau of Public Roads.

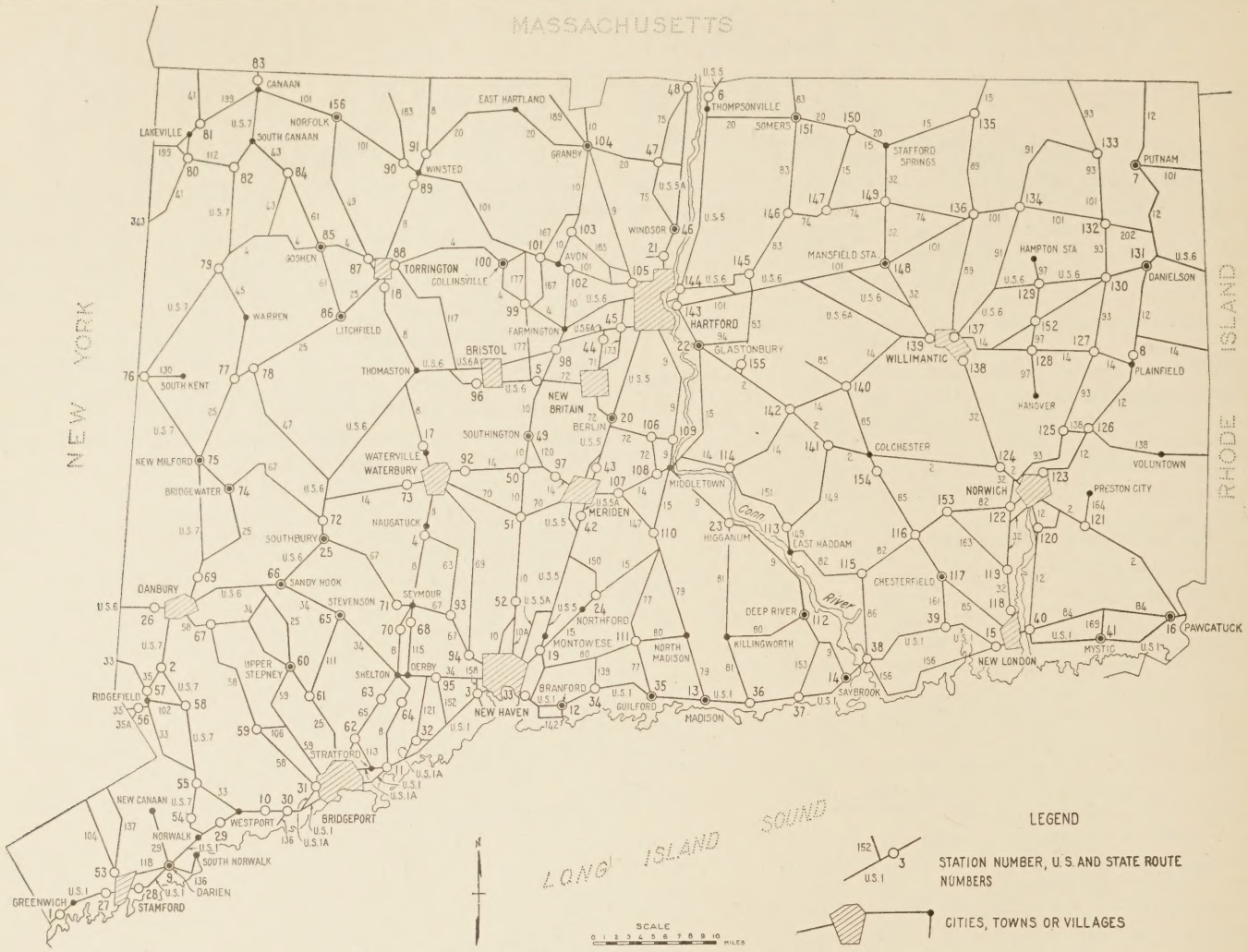

FIGURE 1.—LOCATIONS OF TRAFFIC RECORDING STATIONS.

from a legislative act that requires all busses making regular trips through the State to carry Connecticut registration tags. The few busses observed without Connecticut tags were principally chartered busses for special events such as football games, seashore outings, etc.

U S 1 CARRIES HEAVIEST TRAFFIC

As shown in figure 2, traffic was heavily concentrated on the trunk-line highways, especially on routes such as U S 1 from east to west, and U S 5 and U S 5A from north to south. The section of U S 1 between New Haven and the New York State line, a portion of the old Boston Post Road, carries traffic from a number of routes converging at New Haven and serves the important cities of Bridgeport, Norwalk, and Stamford.

Figure 6 shows the principal through routes in the State classified according to the average daily density of all local vehicular traffic on each section. These values are based on counts made at survey stations situated along the routes and are grouped in convenient categories. Symbols used for each class are shown in the figure.

Table 2 contains data on the average daily traffic on principal highways throughout the State.

Traffic on through routes traversing heavily populated areas exhibited interesting characteristics, especially with regard to the influence of local and through travel and the use of bypass highways. Figure 7 shows traffic densities as ordinates and the locations along U S 1 of large cities and intersections as abscissas. The black area represents traffic flow on U S 1 and the stippled area represents traffic on the bypass road U S 1A.

The greatest volume of traffic recorded on this route occurred on the section immediately west from New Haven to the intersection with State route 158. This section had a daily average flow of 20,929 vehicles throughout the year. Not only was traffic on this section the heaviest for U S 1 but also for all roads throughout the State.

In figure 7 three general features of traffic flow along the route are evident: (1) Traffic west of New Haven is considerably in excess of that east of the city; (2) bypass roads in the vicinity of Bridgeport functioned for the purpose intended, and the sum of the traffic volumes on the bypass and the old road approximated the average route flow; and (3) traffic densities increased near large cities because of local traffic.

AVERAGE DAILY TRAFFIC COMPARED WITH AVERAGE MAXIMUM TRAFFIC

The maximum traffic densities are developed from data obtained on the particular dates of operation of each station and are a measure of the average maximum traffic. The term "average maximum traffic" has specific reference to the normal peak load existing during the summer periods of heavy week-end travel and

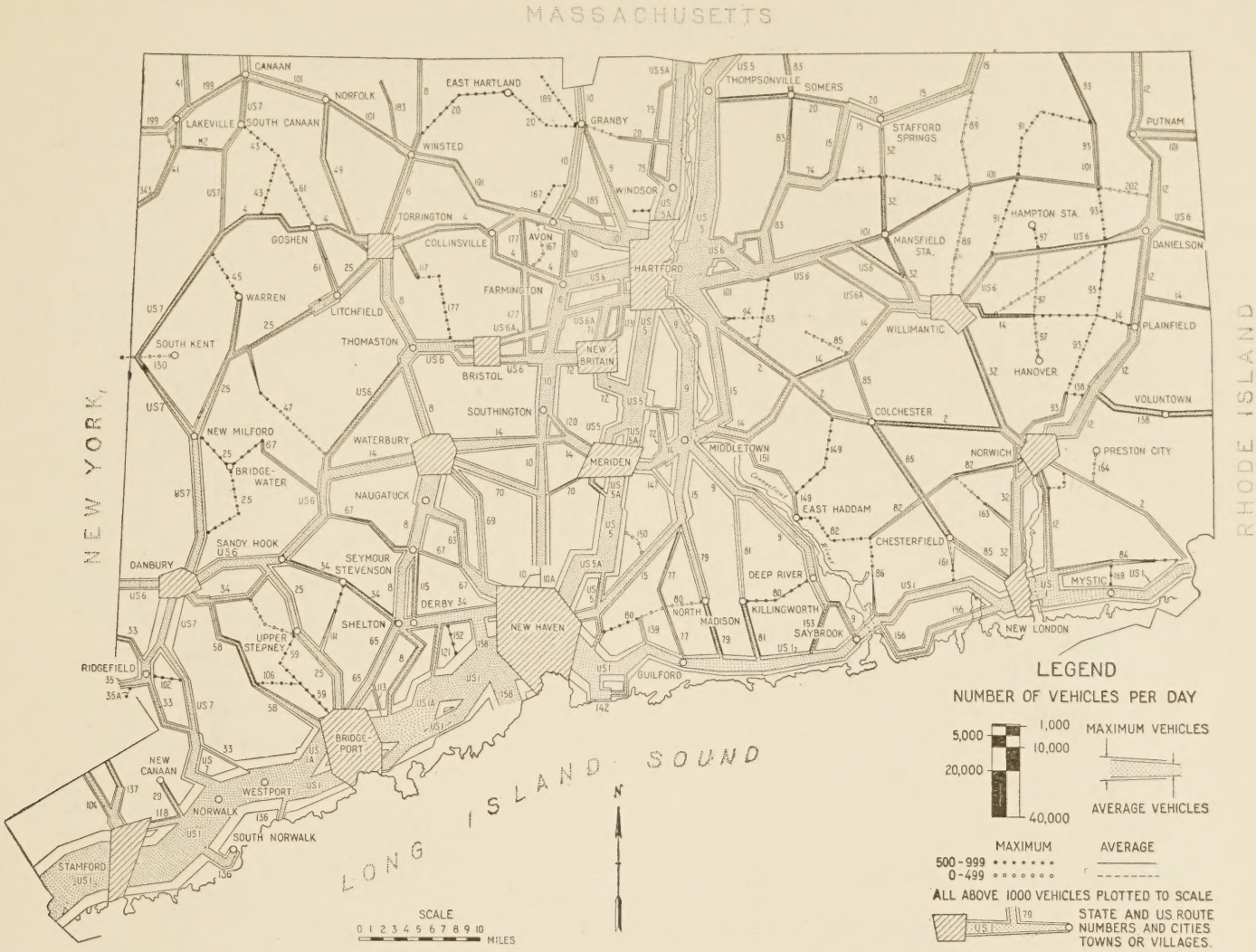

FIGURE 2.—TRAFFIC FLOW BANDS FOR AVERAGE DAILY AND AVERAGE MAXIMUM MOTOR-VEHICLE TRAFFIC. CITY BOUNDARIES ARE DISTORTED TO ALLOW FOR WIDTHS OF TRAFFIC FLOW BANDS.

TABLE 2.—*Average daily traffic on selected highways*

Description of highway		Average daily traffic, all vehicles				Average daily traffic, foreign vehicles	Average daily traffic, local vehicles
Route	Termini and principal points along section	Passenger cars	Trucks	Busses	Total		
U S 1	New York State line, New Haven	12,735	1,903	265	14,903	5,609	9,294
U S 5	New Haven, Meriden, Hartford, Massachusetts State line	5,921	947	154	7,022	1,841	5,181
Conn. 9	Hartford, Middletown	5,238	691	85	6,014	381	5,633
U S 5A	Hartford, Windsor, Massachusetts State line	4,920	890	138	5,948	1,806	4,142
U S 1	New Haven, New London, Rhode Island State line	4,193	663	74	4,930	1,433	3,497
Conn. 65 and 8	Bridgeport, Waterbury, Torrington	3,306	656	40	4,002	368	3,634
Conn. 32	New London, Norwich	3,324	499	55	3,878	370	3,508
Conn. 10	New Haven, Farmington	3,300	468	23	3,791	488	3,303
Conn. 12	Norwich, Putnam, Massachusetts State line	2,774	526	52	3,352	605	2,747
Conn. 15	New Haven, Middletown, Junction Conn. 2 and Conn. 15	2,680	403	47	3,130	828	2,302
Conn. 83, 74, and 15	South Manchester, Rockville, Stafford Springs, Massachusetts State line near Mashapaug.	2,590	319	92	3,001	1,098	1,903
U S 6	New York State line, Danbury, Hartford	2,527	274	18	2,819	809	2,010
Conn. 9	Middletown, Saybrook	2,136	304	23	2,463	152	2,311
Conn. 199 and 101	New York State line, Canaan, Winsted, Hartford	2,074	276	23	2,373	503	1,870
U S 6	Hartford, Willimantic, Danielson, Rhode Island State line	1,739	303	41	2,083	629	1,454
Conn. 2	Junction Conn. 2 and Conn. 15, Colchester, Norwich, Rhode Island State line	1,527	237	17	1,781	251	1,530
Conn. 12	New London, Norwich	1,462	254	31	1,747	189	1,558
Conn. 2 and 15	Hartford, Junction Conn. 2 and Conn. 15 (connecting link for routes Conn. 2 and Conn. 15 to Hartford).	4,837	721	106	5,664	709	4,955

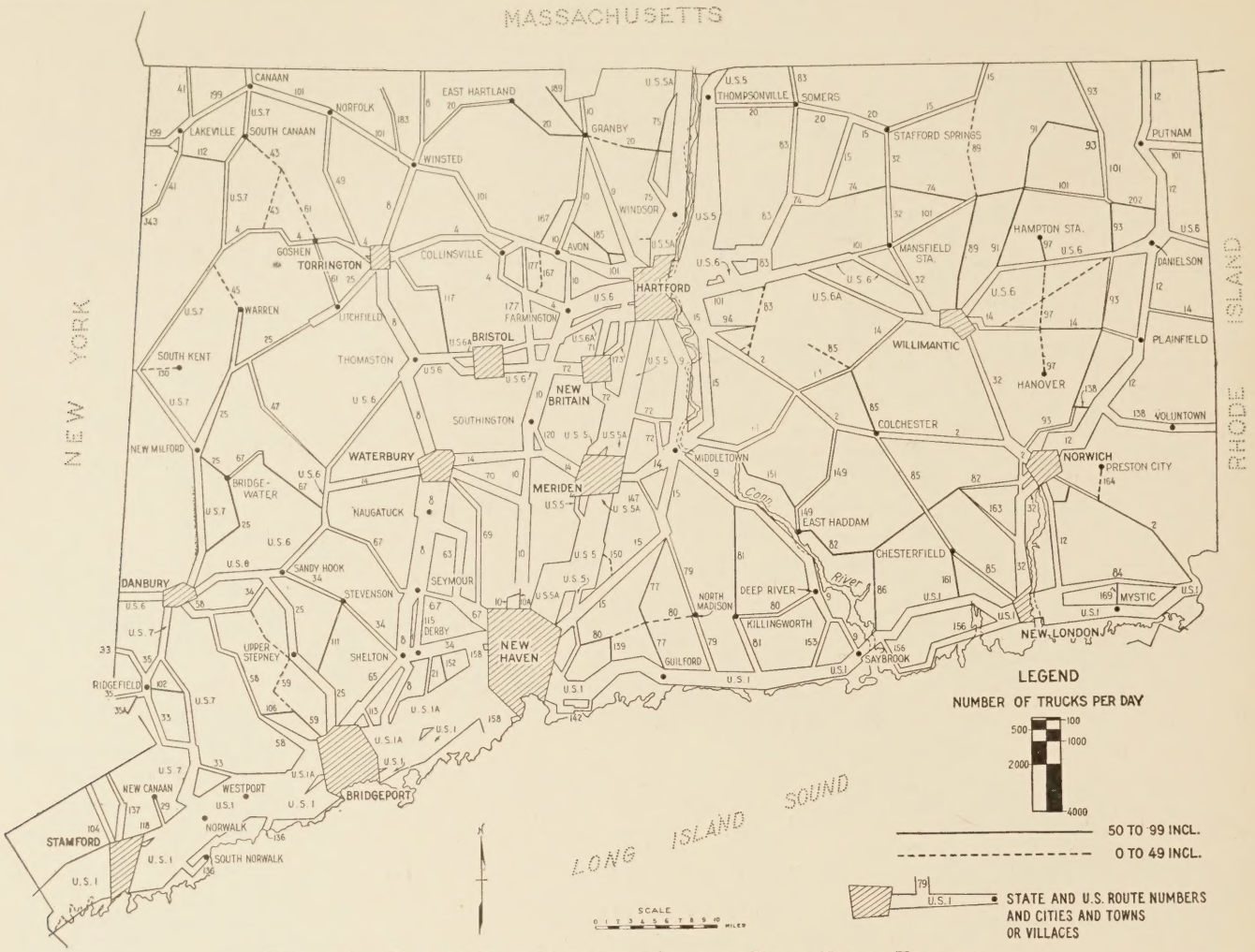

FIGURE 3.—TRAFFIC FLOW BANDS FOR AVERAGE DAILY TRUCK TRAFFIC.

should not be confused with the precise peak or actual maximum count of the year. Sunday or Monday of the Labor Day period, and Independence Day when occurring on a Saturday or Monday, are known to have maximum peaks of traffic for most highways; however, a county fair or local celebration might produce the maximum. The average maximum traffic throughout the State occurred on a Sunday in August.

At traffic survey station 2, located at the junction of U S 7 and Connecticut 35, the peak volume occurred on Sunday, October 8, during the progress of the Danbury County Fair. On this day there was recorded on U S 7, north from the station toward Danbury, a total of 7,180 vehicles from 2 p. m. to 10 p. m., when normally a traffic density not to exceed 1,800 vehicles would be the expected volume for this period and season.

The highway engineer is concerned with the average maximum traffic on any section of highway for which he must make improvements within the limits of available funds.

It is not economical to design surface widths and intersections for a free flow of traffic during those extreme peaks that occur once or twice a year. At such times some sacrifice must be made in freedom of flow to accommodate the increased volume.

For those highways covered by the survey, as a group, the average maximum traffic was 162 percent of the average daily traffic. At one location, on Connecticut 61, a minor route of very low traffic density, a maximum variation of 500 percent was recorded. In general, the ratio of average maximum traffic to average daily traffic varied inversely with the volume of the average daily traffic. Highways of relatively low traffic volume had a high ratio of average maximum to average daily traffic, and, conversely highways with heavy traffic volumes generally did not exhibit a high ratio. In Connecticut, 50 sections of highways had a ratio in excess of 200 percent.

Along U S 1 from the New York State line to New Haven, the average maximum traffic was 23,361 vehicles per day and the average daily traffic was 14,903 vehicles. The net difference in the two values represents an increase of approximately 8,500 vehicles per day, although the ratio of increase is but 57 percent. Similarly, on U S 5 north from New Haven via Hartford to the Massachusetts State line near Thompsonville, the average maximum traffic density for the route averaged 10,619 vehicles per day. Comparing this with the average daily traffic density of 7,022 vehicles for this route, the net increase was 3,597 vehicles, or 51 percent. Although the ratios of increase were relatively low, the increments were large.

It is interesting to compare the results obtained in this survey with results of the 1923 traffic survey in Connecticut made by the Bureau in cooperation with the State highway department. At that time route

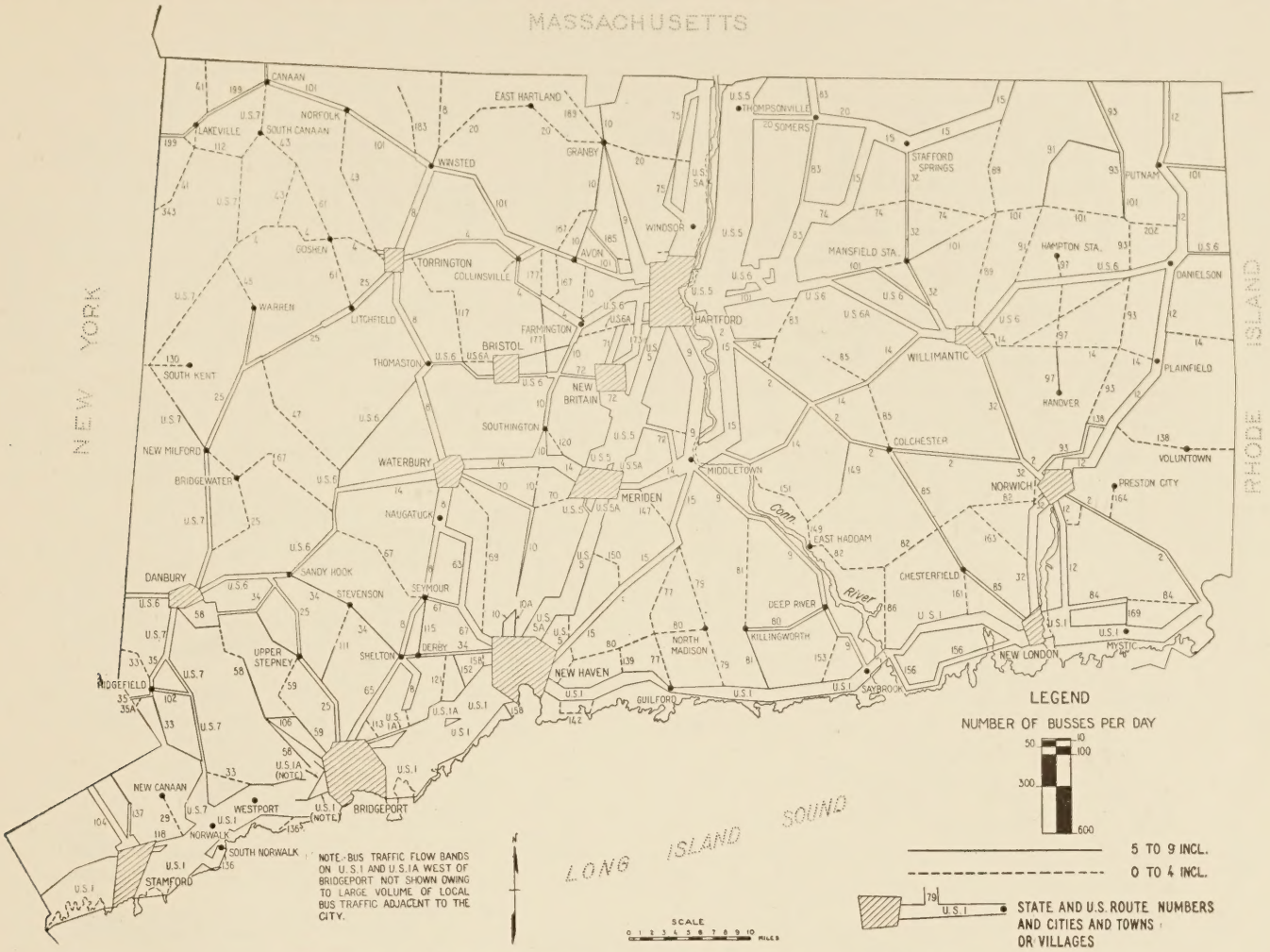

FIGURE 4.—TRAFFIC FLOW BANDS FOR AVERAGE DAILY BUS TRAFFIC.

U S 1 between the New York State line and New Haven carried an average maximum traffic of 8,000 vehicles per day, while 11 years later the same highway was subjected to an average maximum traffic of 23,361 vehicles, an increase of 192 percent. On U S 5 the 1923 average maximum traffic was approximately 5,000 vehicles per day, while in 1934 the average maximum traffic was 10,619 vehicles, an increase of 112 percent. These are cases of unusual traffic growth upon appreciable lengths of highways that originally carried heavy traffic and now carry still greater volumes; the traffic volume more than doubled in a decade.

Foreign vehicles constituted approximately 33 percent of the total traffic on Connecticut highways, and it is interesting to observe their effect on the average maximum traffic. Table 3 shows the average daily and average maximum traffic density values for all vehicles and for foreign vehicles on U S 1, U S 5, and U S 5A between the points indicated. By taking the difference between average maximum traffic and average daily traffic and separating this difference into local and foreign classes, foreign vehicles are found to make up 49.3 percent of the increase. In other words, one-third of the vehicles, by registration, were responsible for one-half of the peak load traffic increase. On these selected routes the ratio of average maximum to average daily traffic for Connecticut vehicles amounted to 146 percent and for foreign vehicles 189 percent.

SEASONAL VARIATIONS OF TRAFFIC FOUND TO BE LARGE

A well-established characteristic of motor-vehicle traffic is that the flow is not regular. Variations are due to a number of causes. The most conspicuous variations are for the season of the year, day of the week, and hour of the day. In the absence of known values for seasonal and daily variations, most State-wide surveys are continued for a full-year period in order that each major influence may be considered in determining the final traffic-density figures. Unusually inclement weather and special events are of short duration and the data are readily adjusted to take them into account.

Although traffic is quite variable, the variations repeat themselves in close order from year to year and under similar conditions, so that the limits of changes may be established to a fair degree of accuracy for an extended period.

Table 4 shows the monthly variations in vehicular traffic throughout Connecticut expressed as percentages of the average monthly traffic. These data are based on the average daily traffic during the month irrespective of the number of days contained in the month. Variations throughout the year are illustrated in figure 8, which shows graphically the fluctuations of local, foreign, and total vehicular traffic.

Traffic volume was greatest in August with 141 percent of that of the average month, and least in February

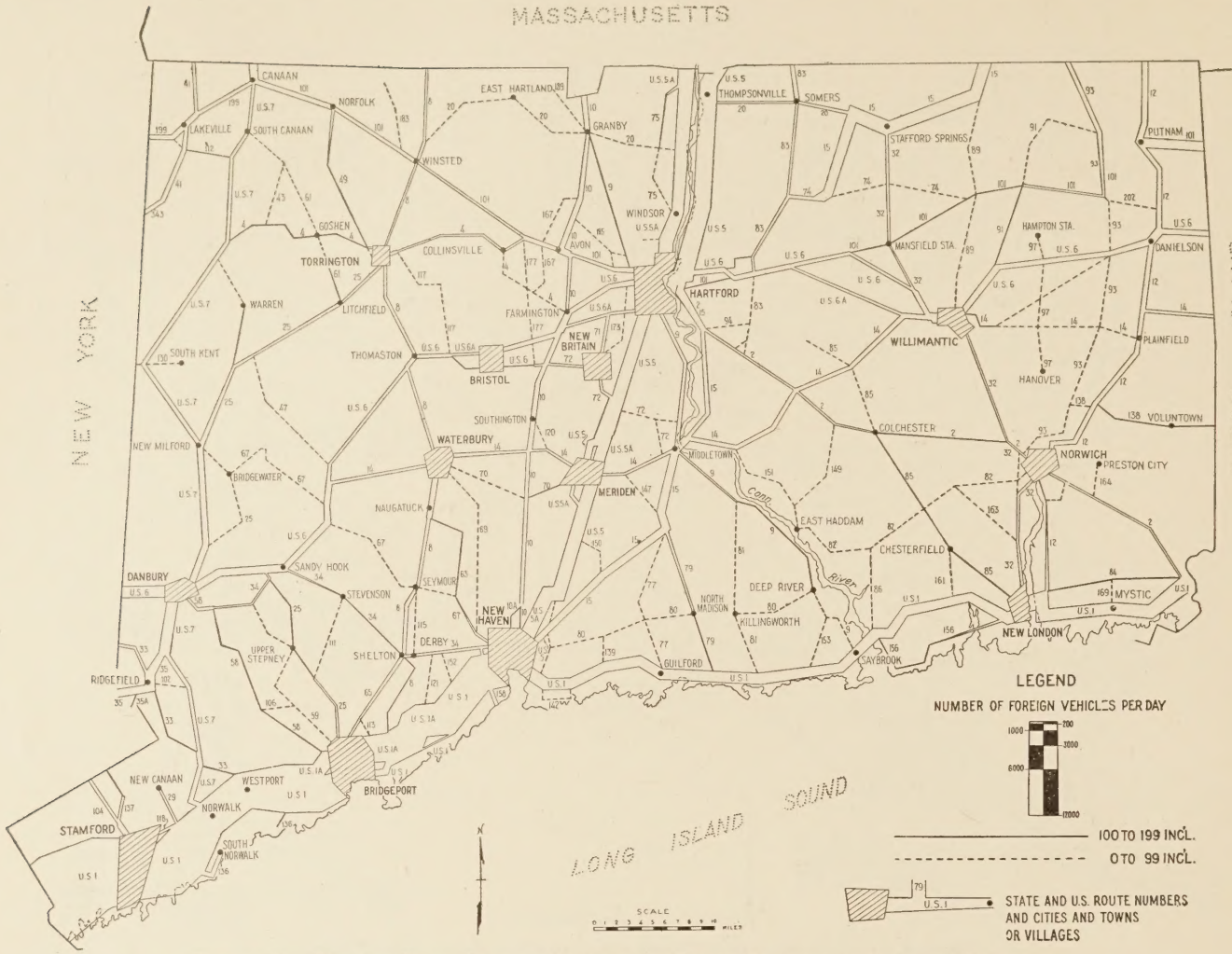

FIGURE 5.—TRAFFIC FLOW BANDS FOR AVERAGE DAILY TRAFFIC OF FOREIGN VEHICLES.

TABLE 3.—*Comparisons of average maximum traffic with average daily traffic on selected routes. Figures are summations of counts at all stations on sections listed*

Stations located between—	U S route	Connecticut vehicles			Foreign vehicles			All vehicles		
		Average maximum traffic	Average daily traffic	Increase	Average maximum traffic	Average daily traffic	Increase	Average maximum traffic	Average daily traffic	Increase
New York State line and New Haven	1	206, 949	148, 716	58, 233	166, 834	89, 739	77, 095	373, 783	238, 455	135, 328
New Haven and Rhode Island State line	1	144, 712	94, 427	50, 285	80, 015	38, 681	41, 334	224, 727	133, 108	91, 619
New Haven and Massachusetts State line	5	45, 113	31, 089	14, 024	18, 601	11, 043	7, 558	63, 714	42, 132	21, 582
Hartford and Massachusetts State line	5A	39, 555	24, 856	14, 699	18, 421	10, 834	7, 587	57, 976	35, 690	22, 286
Total		436, 329	299, 088	137, 241	283, 871	150, 297	133, 574	720, 200	449, 385	270, 815
Percentage of total increase				50. 7			49. 3			100. 0

with 49 percent of that of the average month. The approximate periods of average monthly traffic for the State as a whole occurred from the middle of April to the middle of May, and again from the middle of October to the middle of November.

Foreign traffic fluctuated much more widely than did local traffic from a low of 33 percent in February to a high of 172 percent in July. The range for Connecticut vehicles was from 54 percent in February to 134 percent in August. There will be noted an unusual circumstance in that foreign vehicles reached their maximum during the month of July, while Connecticut vehicles were at their maximum during August.

DAILY VARIATIONS IN TRAFFIC FOLLOW WELL-ESTABLISHED TRENDS

Variations in traffic density by the days of the week are shown in table 5 and figure 9, all items being expressed as percentages of the average week-day traffic for each type of vehicle. Week days are from Monday to Friday, inclusive.

The general characteristics of daily variations are well known and change but slightly in different sections of the country. Sunday is the day of greatest travel, with Saturday next. On the remaining five days of the week the traffic is rather uniform. On Sunday the total traffic is 137 percent of the average week-day

TABLE 4.—*Monthly variations in traffic density expressed as percentages of average monthly traffic*

Month	Passenger cars			Trucks			Busses			All vehicles		
	Connecticut	Foreign	Total	Connecticut	Foreign	Total	Connecticut	Foreign	Total	Connecticut	Foreign	Total
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
January	68	47	63	87	81	86	99	42	98	72	51	66
February	52	28	45	67	68	67	74	105	74	54	33	49
March	80	63	76	89	100	92	102	63	102	82	67	78
April	97	77	92	97	82	94	95	63	95	97	78	92
May	117	108	115	114	132	118	109	63	109	117	110	115
June	123	127	124	109	102	108	99	127	99	120	125	121
July	120	179	135	107	119	109	110	84	110	118	172	132
August	138	170	146	116	103	113	104	63	104	134	163	141
September	118	150	126	109	142	116	122	105	121	116	149	125
October	121	120	121	118	130	120	96	168	97	120	121	120
November	94	83	91	105	89	101	103	190	103	96	83	93
December	72	48	66	82	52	76	87	127	88	74	48	68

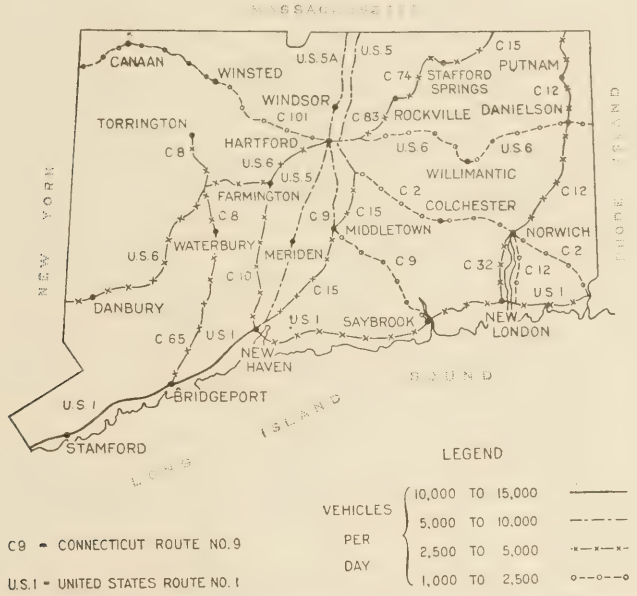

FIGURE 6.—PRINCIPAL HIGHWAYS CLASSIFIED BY TRAFFIC DENSITY.

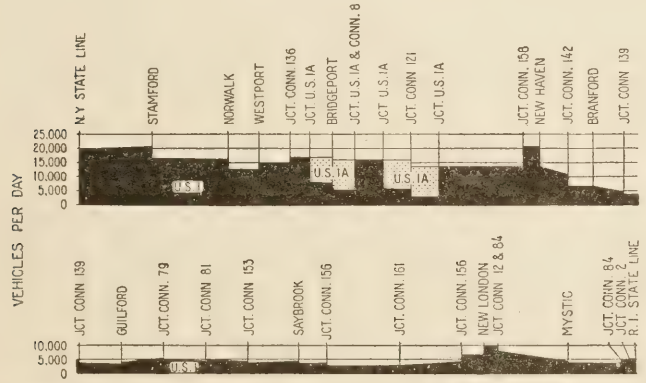

FIGURE 7.—VARIATIONS IN AVERAGE DAILY TRAFFIC ALONG U S 1 AND U S 1A IN CONNECTICUT.

traffic; local vehicles are 127 percent of the average week-day traffic; and foreign vehicles are 170 percent of average week-day traffic.

Vehicles registered in States other than Connecticut used the State highways to the extent of 22.6 percent of all recorded traffic. They were much in evidence in all parts of the State, nearly one out of every four vehicles bearing the license of an adjacent or distant

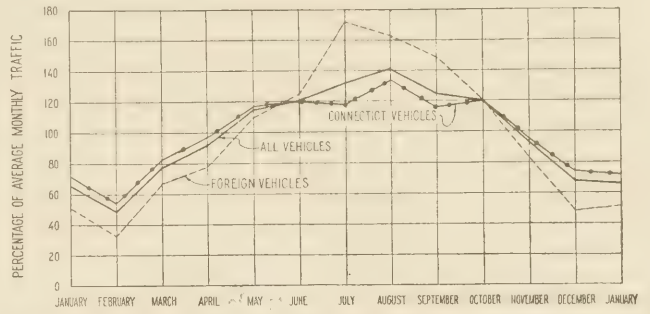

FIGURE 8.—MONTHLY VARIATIONS IN LOCAL, FOREIGN, AND TOTAL TRAFFIC.

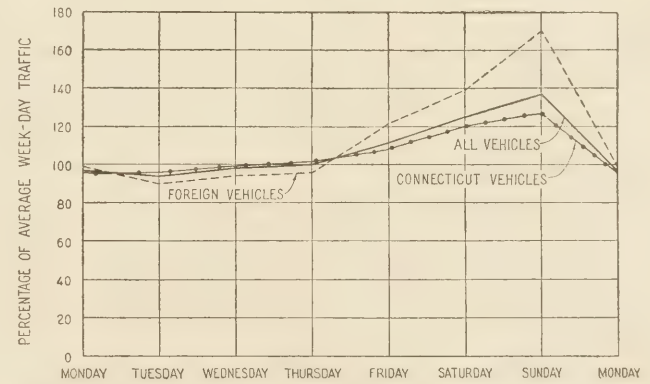

FIGURE 9.—DAILY VARIATIONS IN LOCAL, FOREIGN, AND TOTAL TRAFFIC. WEEK-DAY TRAFFIC IS TRAFFIC MONDAY TO FRIDAY, INCLUSIVE.

State, principally the neighboring States of New York, Massachusetts, and Rhode Island. On the principal through routes U S 1 and U S 5 with their alternates U S 1A and U S 5A, foreign vehicles contributed 33.4 percent of the total vehicle flow, or one in every three vehicles.

DETAILED DATA OBTAINED FOR TRUCK AND BUS TRAFFIC

Detailed information relating to the characteristics and movement of bus and truck traffic was obtained at 26 selected stations on the principal highways of the State. At least one station was located upon each of the major highways and on more heavily traveled arteries there were several stations. Data were collected on the situs of ownership of the vehicle; its classification as owner operated, contract hauler, or common carrier; the gross load of the vehicle and contents; contact with railroad service; classification of the

TABLE 5.—*Daily variations in traffic density expressed as percentages of average week-day traffic* [1]

	Passenger cars			Trucks			Busses			All vehicles		
	Connecticut	Foreign	Total	Connecticut	Foreign	Total	Connecticut	Foreign	Total	Connecticut	Foreign	Total
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Monday	95	100	96	99	92	98	103	100	103	96	99	97
Tuesday	95	88	93	100	101	100	96	100	96	96	90	94
Wednesday	100	93	99	95	97	96	98	100	98	99	94	98
Thursday	101	95	99	102	105	102	99	100	99	101	96	100
Friday	109	124	113	104	105	104	104	100	104	108	121	111
Saturday	127	151	133	90	66	85	102	100	102	120	139	125
Sunday	148	190	158	32	48	35	87	100	87	127	170	137

[1] Week days are Monday to Friday, inclusive.

trip as inter-city, from country to country, or between city and country; and the trip origin and destination. The information was obtained throughout 8-hour periods of operation upon the schedule previously described, and a representative sample of truck and bus traffic was obtained at each station.

It should be understood that the figures presented in this section of the report relate solely to the sample of truck and bus traffic and not to the actual number of individual vehicles of a certain type. For example, if the same truck made 10 trips a day past a recording station, it was counted 10 times in this sample. Because of the possibility of almost unlimited variations in this respect, no attempt should be made to determine from these figures the actual number of separate vehicles of a particular kind or class in the State. It is not the purpose of this analysis to furnish that information. It aims, rather, to present a general cross section of truck and bus traffic as it moved over the highways of the State. Each statement regarding the proportion of a certain class of vehicles in any breakdown refers exclusively to the particular sample of highway traffic under consideration. Therefore, figures or percentages presented in one analysis should not be applied to another without a clear understanding of the nature of both. It will be observed that the size of the sample presented in the different tables varies slightly, owing to the failure of the recorders to obtain all items of information for every vehicle.

TRUCK AND BUS CONTACTS WITH RAILROAD SERVICES DISCUSSED

Table 6 lists the locations where truck and bus data were obtained and shows that but six trucks per thousand contacted railroad stations at any time during the trip. All of the locations at which data were obtained were located outside city limits upon main highways, and the above statement therefore applies only to truck traffic in suburban and interurban areas. A similar examination within cities would undoubtedly show a much higher proportion of trucks contacting railroad services. A great majority of the trucks making railroad contact were operated as common carriers.

About 25 percent of the busses called at railroad stations one or more times per trip, and in certain parts of the State the proportion was much greater. For instance, at the station on U S 8 north of Waterville, 67 percent of all busses were found to have stopped at railroad stations at some time during the trip. At other locations as few as six busses per thousand were found to have contacted railroad services.

DATA ON SITUS OF OWNERSHIP AND TRIP CLASSIFICATION OF TRUCKS PRESENTED

The classification of trucks according to situs of ownership—in cities of 2,500 population or over, in villages having fewer than 2,500 inhabitants, or on farms—is tabulated by stations in table 7. According to this classification, 84 percent of all trucks were city owned, and the remainder were divided about equally between village and farm ownership. The proportion of city-owned trucks was smallest in eastern and northwestern Connecticut. At all but one traffic station city-owned trucks were found to be more than 60 percent of the total truck traffic, and at many stations the number of trucks owned by city dwellers exceeded 90 percent of the total count at the station.

Information obtained from truckers with regard to the origin and destination of truck traffic showed that 94 percent of the trucks operating upon Connecticut highways had either one or both terminals within a city, and that 6 percent were traveling between points in the country. For the purposes of trip classification, cities are localities with 2,500 or more population and the remaining areas are considered country. Of the 94 percent of trucks where one or both terminals were within a city, 65 percent were intercity trips, 15 percent were from city to country, and 14 percent were from country to city.

TRUCKS CLASSIFIED BY TYPE OF OPERATION

Of the total sample of truck traffic throughout the State, about three-fourths were owner-operated (serving owners), the other one-fourth was engaged in commercial trucking as contract haulers and common carriers. Contract haulers make special trips when and where desired, at rates agreed upon by the contracting parties; common carriers follow established routes between fixed points, operate on a regular schedule, and charge standard published rates.

The distribution of trucks among these 3 classes of operation is presented in table 8. The 1 common factor was the preponderance of owner-operated trucks, 64 percent or more of the trucks recorded at each station being used in the business of owners. Although it is difficult to find an indication of general trends in these figures for individual stations, variations within certain ranges for groups of stations are significant. On the 3 most heavily traveled routes, U S 1 west of New Haven, U S 5, and U S 5A—the percentages of trucks operated by owners varied between a low of 63.8 and a high of 76.9 percent. For all stations not on these 3 routes, the range of percentages is between 69.9 and 89.5 percent, or 6 and 13 points higher than the corresponding figures for the former group. From this comparison, it is clear that owner-operated trucks more frequently follow the less-traveled routes; or, conversely, that commercial trucks (contract haulers and common carriers) are found more often on the heavily traveled highways.

TABLE 6.—*Sample of truck and bus traffic on Connecticut highways and contacts with railroad service*

Location of station	Trucks		Busses		Railroad contact				Trucks and busses, total sample
					Trucks		Busses		
	Number	Percentage of total	Number	Percentage of total	Number	Percentage of total trucks	Number	Percentage of total busses	
U S 1, southwest of Greenwich	7,818	89.3	935	10.7	24	0.3	170	18.2	8,753
U S 1, at Darien	6,841	88.9	858	11.1	25	.4	150	17.5	7,699
U S 1, east of Westport	7,480	90.0	829	10.0	25	.3	155	18.7	8,309
U S 1, east of Stratford	9,723	86.2	1,559	13.8	30	.3	459	29.4	11,282
U S 1, west of New Haven	8,097	87.8	1,122	12.2	26	.3	271	24.2	9,219
U S 1, at Branford	4,165	91.7	378	8.3	33	.8	105	27.8	4,543
U S 1, at Madison	3,069	89.0	379	11.0	23	.7	104	27.4	3,448
U S 1, at Saybrook	1,993	92.4	163	7.6	16	.8	38	23.3	2,156
U S 1, west of New London	4,798	90.0	536	10.0	22	.5	86	16.0	5,334
U S 1, at Pawcatuck	2,461	87.9	340	12.1	25	1.0	73	21.5	2,801
U S 5, at Berlin	3,518	83.0	720	17.0	23	.7	265	36.8	4,238
U S 5, north of Thompsonville	2,316	69.7	1,006	30.3	1	(1)	392	39.0	3,322
U S 5A, south of State line	2,181	85.7	364	14.3	18	.8	130	35.7	2,545
U S 7, northeast of Ridgefield	1,555	88.1	211	11.9	6	.4	102	48.3	1,766
U S 6, west of Danbury	1,676	91.5	155	8.5	12	.7	1	.6	1,831
U S 6, at Southbury	1,098	93.0	83	7.0	9	.8	2	2.4	1,181
U S 6, at Plainville	2,464	94.8	136	5.2	12	.5	52	38.2	2,600
Conn. 8, at Naugatuck	3,277	96.5	119	3.5	10	.3			3,396
Conn. 8, north of Waterville	2,091	92.1	179	7.9	21	1.0	120	67.0	2,270
Conn. 8, south of Torrington	2,097	92.8	162	7.2	9	.4	92	56.8	2,259
Conn. 15 and U S 5, south of Montowese	2,890	93.7	194	6.3	22	.8	61	31.4	3,084
Conn. 15, north of Northford	1,590	89.8	181	10.2	14	.8	52	28.7	1,771
Conn. 15, Conn. 2, at Glastonbury	3,479	87.5	496	12.5	10	.3	3	.6	3,975
Conn. 9, at Higganum	1,728	93.7	117	6.3	26	1.6	1	.9	1,845
Conn. 12 and Conn. 14 north of Plainfield	1,783	85.0	314	15.0	42	2.4	12	3.8	2,097
Conn. 12 and Conn. 101, at Putnam	2,981	93.0	226	7.0	54	1.8	3	1.3	3,207
Total at all truck and bus stations	93,169	88.8	11,762	11.2	538	.6	2,899	24.6	104,931

[1] Less than 0.1 percent.

TABLE 7.—*Situs of ownership of trucks using Connecticut highways*

Location of station	City ownership		Village ownership		Farm ownership		Total number of trucks
	Number	Percentage of total	Number	Percentage of total	Number	Percentage of total	
U S 1, southwest of Greenwich	7,351	94.1	246	3.2	212	2.7	7,809
U S 1, at Darien	6,373	93.6	172	2.5	262	3.9	6,807
U S 1, east of Westport	6,954	93.3	202	2.7	300	4.0	7,456
U S 1, east of Stratford	8,588	88.9	643	6.6	432	4.5	9,663
U S 1, west of New Haven	7,093	88.5	335	4.2	590	7.3	8,018
U S 1, at Branford	3,345	80.6	250	6.0	557	13.4	4,152
U S 1, at Madison	1,887	61.9	900	29.5	263	8.6	3,050
U S 1, at Saybrook	1,380	70.6	479	24.5	95	4.9	1,954
U S 1, west of New London	3,335	70.0	830	17.4	599	12.6	4,764
U S 1, at Pawcatuck	1,536	62.6	557	22.7	360	14.7	2,453
U S 5, at Berlin	3,282	93.4	87	2.5	145	4.1	3,514
U S 5, north of Thompsonville	2,089	90.6	75	3.2	142	6.2	2,306
U S 5A, south of State line	1,981	91.0	65	3.0	131	6.0	2,177
U S 7, northeast of Ridgefield	1,051	67.7	294	18.9	208	13.4	1,553
U S 6, west of Danbury	1,225	73.8	201	12.1	234	14.1	1,660
U S 6, at Southbury	640	58.5	274	25.0	181	16.5	1,095
U S 6, at Plainville	2,168	88.2	98	4.0	192	7.8	2,458
Conn. 8, at Naugatuck	3,039	92.8	112	3.4	123	3.8	3,274
Conn. 8, north of Waterville	1,836	88.3	58	2.8	186	8.9	2,080
Conn. 8, south of Torrington	1,775	85.0	91	4.4	222	10.6	2,088
Conn. 15 and U S 5, south of Montowese	1,921	67.2	262	9.2	676	23.6	2,859
Conn. 15, north of Northford	1,092	69.3	199	12.6	286	18.1	1,577
Conn. 15, at Glastonbury	2,811	81.8	195	5.7	430	12.5	3,436
Conn. 9 at Higganum	1,107	64.7	390	22.8	214	12.5	1,711
Conn. 12 and Conn. 14 north of Plainfield	1,308	74.0	315	17.8	145	8.2	1,768
Conn. 12 and Conn. 101, at Putnam	2,483	83.5	194	6.5	298	10.0	2,975
Total at all truck and bus stations	77,650	83.8	7,524	8.1	7,483	8.1	92,657

TRIPS OF ONE-THIRD OF TRUCKS FOUND TO EXTEND OUTSIDE OF STATE

An analysis of the origin and destination of 93,913 trucks is presented in table 9 and in figure 10. A little less than two-thirds of these trucks operated only within the State. About 25 percent of the trucks had only one terminal in Connecticut, and less than 10 percent were traveling between points in other States. The latter group constitutes what is ordinarily called "through traffic." In a similar analysis of New Jersey traffic one truck out of three had either one or both terminals outside the State.

In the majority of cases owner-operated trucks had both origin and destination in Connecticut, while contract-hauler and common-carrier trucks operated to a much greater extent in interstate traffic. Trucks of each class of operation making interstate trips had both terminals outside Connecticut less often than one terminal within and one outside the State, but a relatively greater percentage of commercial trucks had both terminals outside the State. Comparatively few owner-operated trucks passed through Connecticut en route between other States, but about one commercial truck out of five was classed as through traffic.

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TABLE 8.—*Truck traffic on Connecticut highways by class of operation*

Location of station	Owner operator		Contract hauler		Common carrier		Total number of trucks
	Number	Percentage of total	Number	Percentage of total	Number	Percentage of total	
U S 1, southwest of Greenwich	5,303	68.0	1,578	20.2	922	11.8	7,803
U S 1, at Darien	4,726	69.3	1,265	18.5	832	12.2	6,823
U S 1, east of Westport	5,296	71.1	1,505	20.2	651	8.7	7,452
U S 1, east of Stratford	7,181	74.2	1,815	18.7	684	7.1	9,680
U S 1, west of New Haven	5,691	70.9	1,702	21.2	633	7.9	8,026
U S 1, at Branford	3,353	80.7	564	13.6	237	5.7	4,154
U S 1, at Madison	2,300	75.2	515	16.8	243	8.0	3,058
U S 1, at Saybrook	1,388	69.9	426	21.5	171	8.6	1,985
U S 1, west of New London	3,930	82.3	611	12.8	235	4.9	4,776
U S 1, at Pawcatuck	1,900	77.6	405	16.6	143	5.8	2,448
U S 5, at Berlin	2,434	69.3	767	21.9	307	8.8	3,508
U S 5, north of Thompsonville	1,769	76.9	409	17.8	123	5.3	2,301
U S 5A, south of State line	1,390	63.8	465	21.4	322	14.8	2,177
U S 7, northeast of Ridgefield	1,302	83.7	197	12.7	56	3.6	1,555
U S 6, west of Danbury	1,494	89.3	148	8.8	31	1.9	1,673
U S 6, at Southbury	944	86.2	108	9.9	43	3.9	1,095
U S 6, at Plainville	2,197	89.5	170	6.9	87	3.6	2,454
Conn. 8, at Naugatuck	2,374	72.6	548	16.7	350	10.7	3,272
Conn. 8, north of Waterville	1,619	77.8	299	14.4	163	7.8	2,081
Conn. 8, south of Torrington	1,725	82.3	236	11.2	136	6.5	2,097
Conn. 15 and U S 5, south of Montowese	2,323	81.2	419	14.6	119	4.2	2,861
Conn. 15, north of Northford	1,164	73.3	337	21.2	87	5.5	1,588
Conn. 15, Conn. 2, at Glastonbury	2,981	86.3	349	10.1	123	3.6	3,453
Conn. 9, at Higganum	1,535	88.9	129	7.5	62	3.6	1,726
Conn. 12 and Conn. 14, north of Plainfield	1,289	72.7	348	19.6	137	7.7	1,774
Conn. 12 and Conn. 101 at Putnam	2,416	81.2	398	13.4	160	5.4	2,974
Total at all truck and bus stations	70,024	75.5	15,713	16.9	7,057	7.6	92,794

TABLE 9.—*Truck traffic on Connecticut highways making State and interstate trips, by class of operation*

Origin and destination	Owner operator		Contract hauler	
	Number	Percent	Number	Percent
Both in Connecticut	51,307	72.4	5,908	37.1
1 in Connecticut	16,683	23.5	6,261	39.4
Both outside Connecticut	2,916	4.1	3,743	23.5
Total	70,906	100.0	15,912	100.0

Origin and destination	Common carrier		All classes	
	Number	Percent	Number	Percent
Both in Connecticut	2,836	40.0	60,051	63.9
1 in Connecticut	2,939	41.4	25,883	27.6
Both outside Connecticut	1,320	18.6	7,979	8.5
Total	7,095	100.0	93,913	100.0

The topography of the New England States is such that Connecticut forms a natural and comparatively level thoroughfare for traffic between the eastern seaboard and central valley districts, New York City, and other points to the south and west. The Berkshire Mountains parallel the western boundary of Massachusetts along its entire length, and the Green Mountains of Vermont erect an effective barrier to east and west traffic except at a few points. Accordingly, a considerable part of truck traffic on Connecticut highways was going to or from other New England States and eastern Canada. The flow of truck traffic is clearly shown in table 10 and figure 11.

Owner-operated trucks from New York were going principally to points in Connecticut and other New England States, with a very small percentage passing through Connecticut en route from the New York City metropolitan area to other parts of New York State. In contrast with owner-operated trucks, a smaller proportion of contract-hauler trucks from each of the origins indicated in the table was destined for points in Connecticut.

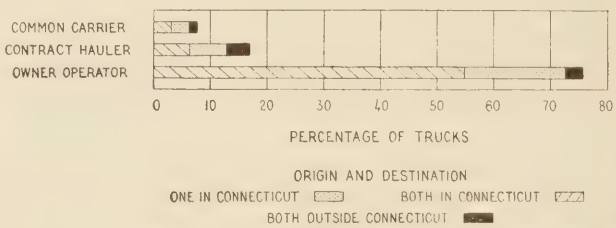


FIGURE 10.—TRUCK TRAFFIC CLASSIFIED BY KIND OF TRIP AND CLASS OF OPERATION.

The proportion of common-carrier trucks originating in New England and bound for New York State was approximately the same as that of contract-hauler trucks, but a greater percentage of common carriers had their destination in Connecticut, and fewer were running to more distant States. Common-carrier trucks from New York also showed a greater proportion stopping in Connecticut and relatively fewer continuing through the State to other parts of New England.

That part of truck traffic on Connecticut highways having one or both terminals within the State may be considered as of primary importance to the State itself. A comparison of the dispersion of truck traffic originating or terminating in Connecticut is presented in table 11. The relative importance of each geographic area as the origin and destination of truck traffic is shown, for each of the three classes of operation, in figure 12. More than 80 percent of this traffic remained within the boundaries of Connecticut, and by far the greater part of the remainder was between Connecticut and other New England States, including a very small amount of traffic with Canada and New York State, principally the New York City metropolitan area. New Jersey claimed a little less than 1 percent of this traffic, and only occasionally were trucks found making trips between Connecticut and Pennsylvania, Delaware, Maryland, Virginia, and the District of Columbia. Trucks to or from more distant States were rarely found. The close parallel between the two series of figures in table 11 again serves to

TABLE 10.—*Truck traffic classified by type of operation and by origin and destination*

Class of operation and destination	Origin of truck traffic: New England [1] and Canada		Connecticut		New York		New Jersey		Pennsylvania		Delaware, Maryland, Virginia, and District of Columbia		Other States		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
OWNER OPERATOR																
New England [1] and Canada	101	2.2	2,991	5.0	1,186	19.5	189	37.5	67	59.8	77	71.3	42	50.6	4,653	6.6
Connecticut	3,225	71.2	51,307	86.3	4,857	79.8	313	62.1	44	39.3	29	26.9	39	47.0	59,814	84.3
New York	786	17.4	4,745	8.0	40	.7	2	.4	1	.9	2	1.8	1	1.2	5,577	7.9
New Jersey	174	3.9	320	.5	2	(2)									496	.7
Pennsylvania	69	1.5	45	.1											114	.2
Delaware, Maryland, Virginia, and District of Columbia	142	3.1	58	.1	1	(2)									201	.3
Other States	33	.7	17	(2)									1	1.2	51	(2)
Total	4,530	100.0	59,483	100.0	6,086	100.0	504	100.0	112	100.0	108	100.0	83	100.0	70,906	100.0
CONTRACT HAULER																
New England [1] and Canada	60	2.1	1,048	11.8	1,414	43.5	233	46.0	121	66.5	75	74.3	70	64.8	3,021	19.0
Connecticut	1,066	37.2	5,908	66.4	1,817	55.9	269	53.2	59	32.4	25	24.7	32	29.6	9,176	57.7
New York	1,243	43.4	1,560	17.5	13	.4	4	.8	2	1.1	1	1.0	6	5.6	2,829	17.8
New Jersey	287	10.0	254	2.9	1	(2)									542	3.4
Pennsylvania	107	3.7	75	.8											182	1.1
Delaware, Maryland, Virginia, and District of Columbia	67	2.4	31	.3	3	.1									101	.6
Other States	34	1.2	25	.3	2	.1									61	.4
Total	2,864	100.0	8,901	100.0	3,250	100.0	506	100.0	182	100.0	101	100.0	108	100.0	15,912	100.0
COMMON CARRIER																
New England [1] and Canada	20	2.1	473	11.7	701	37.4	73	52.9	11	40.7	3	60.0	7	53.8	1,288	18.2
Connecticut	461	47.0	2,836	69.9	1,171	62.4	65	47.1	15	55.6	2	40.0	6	46.2	4,556	64.2
New York	431	43.9	685	16.9	2	.1			1	3.7					1,119	15.8
New Jersey	51	5.2	40	1.0	1	.1									92	1.3
Pennsylvania	8	.8	18	.4	1										27	.4
Delaware, Maryland, Virginia, and District of Columbia	8	.8	2	.1											10	.1
Other States	2	.2	1	(2)											3	(2)
Total	981	100.0	4,055	100.0	1,876	100.0	138	100.0	27	100.0	5	100.0	13	100.0	7,095	100.0
ALL CLASSES																
New England [1] and Canada	181	2.2	4,512	6.2	3,301	29.4	495	43.1	199	62.0	155	72.4	119	58.3	8,962	9.6
Connecticut	4,752	56.7	60,051	82.9	7,845	70.0	647	56.4	118	36.8	56	26.2	77	37.8	73,546	78.3
New York	2,460	29.4	6,990	9.7	55	.5	6	.5	4	1.2	3	1.4	7	3.4	9,525	10.2
New Jersey	512	6.1	614	.8	4										1,130	1.2
Pennsylvania	184	2.2	138	.2	1	.1									323	.3
Delaware, Maryland, Virginia, and District of Columbia	217	2.6	91	.1	4										312	.3
Other States	69	.8	43	.1	2								1	.5	115	.1
Total	8,375	100.0	72,439	100.0	11,212	100.0	1,148	100.0	321	100.0	214	100.0	204	100.0	93,913	100.0

[1] Except Connecticut.

[2] Less than 0.1 percent.

emphasize the point that traffic between given localities tends to be the same in both directions. The subdivision of this truck traffic according to class of operation is presented in figure 11.

The distribution of through truck traffic according to destination is shown in table 12. The relative importance of each area as both origin and destination of trucks passing through Connecticut is shown in figure 13. Figures 12 and 13 show clearly that trucks engaged in both classes of commercial hauling are found much more frequently in through traffic than in traffic that has its origin or destination in Connecticut.

Trucks having both terminals within Connecticut constituted 63.9 percent of all trucks whose origins and destinations were recorded. Approximately one-third of this intrastate truck traffic was between 15 cities in various localities. Details of this analysis are presented in table 13, and also in figure 14. Owner-operated trucks were more frequently operating between other points than these 15 cities, though many may have had either their origin or destination in one or another of them. Only 28 percent of the entire number of owner-operated trucks in intrastate traffic made their trips between cities enumerated above. Contract haulers were about equally divided in their operation between pairs of these cities and between other points, and only 1 out of 3 common carriers had either or both terminals outside these cities.

Analysis of intercity truck traffic originating in principal Connecticut cities is possible where truck counts were taken at points on the principal routes between them. Ordinarily, the bulk of truck traffic was between neighboring cities, although larger but more distant cities sometimes drew a considerable amount of traffic. Local traffic with nearby places consisted chiefly of owner-operated trucks, a large proportion of these undoubtedly being of the retail delivery class. Traffic to more distant points frequently showed a greater proportion of contract-hauler and common-carrier trucks.

GROSS WEIGHTS OF TRUCKS MEASURED

Scales were available at 11 stations at which the combined weights of the vehicles and loads were obtained. This weight is hereafter referred to as gross weight.

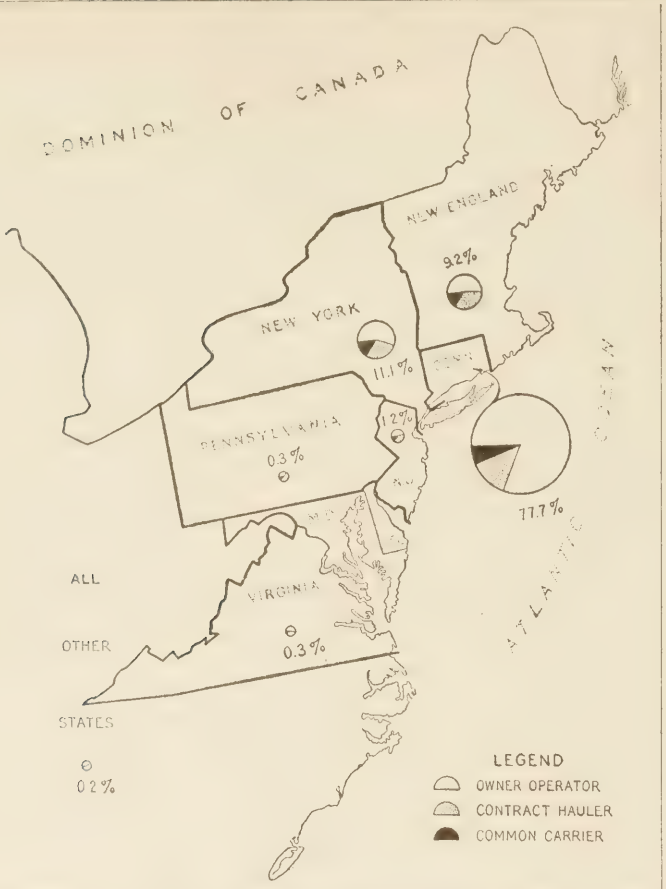


FIGURE 11.—RELATIVE IMPORTANCE OF EACH AREA AS THE ORIGIN AND DESTINATION OF ALL TRUCK TRAFFIC, BY CLASS OF OPERATION. AREAS OF CIRCLES ARE PROPORTIONAL TO PERCENTAGE DISTRIBUTION OF ALL TRUCKS.

FIGURE 12.—RELATIVE IMPORTANCE OF EACH AREA AS THE ORIGIN AND DESTINATION OF TRUCKS HAVING ONE OR BOTH TERMINALS IN CONNECTICUT, BY CLASS OF OPERATION. AREAS OF CIRCLES ARE PROPORTIONAL TO PERCENTAGE DISTRIBUTION OF ALL TRUCKS.

TABLE 11.—*Origin or destination of truck traffic that originates or terminates in Connecticut*

Origin or destination	Trucks having origin in Connecticut		Trucks having destination in Connecticut	
	Number	Percent	Number	Percent
New England and Canada	4,512	6.2	4,752	6.3
Connecticut	60,051	82.9	60,051	81.7
New York	6,990	9.7	7,845	10.7
New Jersey	614	.8	647	.9
Pennsylvania	138	.2	118	.2
Delaware, Maryland, Virginia, and District of Columbia	91	.1	56	.1
All other States	43	.1	77	.1
Total	72,439	100.0	73,546	100.0

TABLE 12.— *Destination of through truck traffic by class of operation*

Destination	Owner operated		Contract hauler		Common carrier		All classes	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
New England and Canada	1,662	57.0	1,973	52.7	815	61.7	4,450	55.8
New York	832	28.5	1,269	33.9	434	32.9	2,535	31.8
New Jersey	176	6.0	288	7.7	52	3.9	516	6.4
Pennsylvania	69	2.4	107	2.9	9	.7	185	2.3
Delaware, Maryland, Virginia, and District of Columbia	143	4.9	70	1.9	8	.6	221	2.8
Other States	34	1.2	36	.9	2	.2	72	.9
Total	2,916	100.0	3,743	100.0	1,320	100.0	7,979	100.0

[1] Except Connecticut.

The locations of these stations, the number of trucks weighed, and the average gross weights at each are shown in table 14.

The weights varied from about 1,000 pounds to as high as 80,000 pounds in the case of a few special vehicles. Light delivery vehicles were classed as trucks, and tractor-semitrailer combinations were weighed as a single unit. The highest average gross weight at any station was 12,100 pounds on U S 5A, south of the Massachusetts State line, and the lowest on Connecticut 12, at Putnam. Generally, high average gross weights were found at stations on U S 1, U S 5 and 5A, the routes on which the greatest traffic density was recorded. The average gross weight of owner-operated trucks was 7,600 pounds; that of contract-hauler trucks, 15,200 pounds; and that of common-carrier trucks, 17,000 pounds; while 9,600 pounds was the average gross weight of all classes of trucks combined. A great majority of owner-operated trucks were in the lower weight groups; only about 20 percent of these weighed 10,500 pounds or over. Among both contract-hauler and common-carrier trucks, however, about two-thirds weighed 10,500 pounds or more.

Trucks on U S 5A south of the State line had the heaviest gross weights and the proportion of contract haulers and common carriers was largest. At Putnam, where the percentage of owner-operated trucks was high, the average gross weight was less than at any other station. In general, average gross weight was greatest where commercial hauling was a high

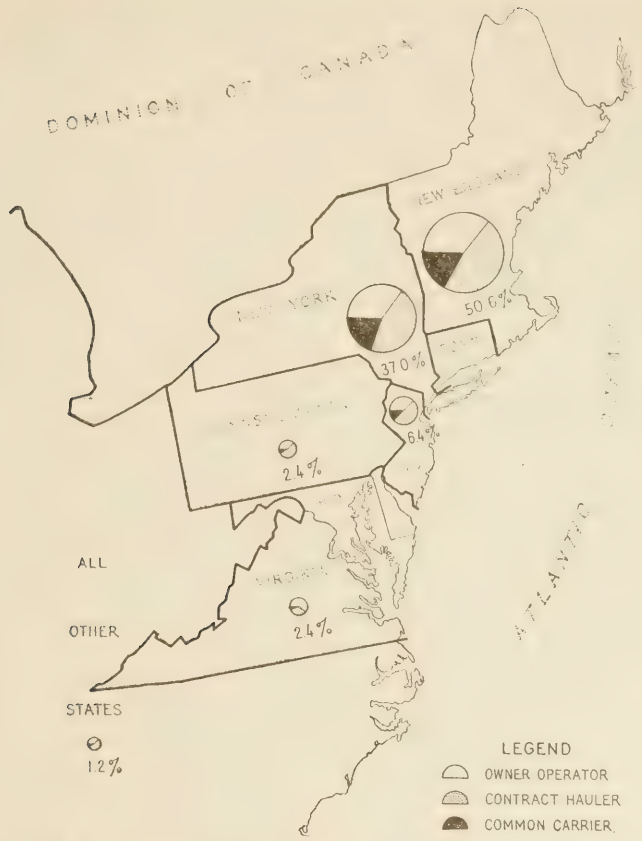


FIGURE 13.—RELATIVE IMPORTANCE OF EACH AREA AS THE ORIGIN AND DESTINATION OF TRUCKS PASSING THROUGH CONNECTICUT, BY CLASS OF OPERATION. AREAS OF CIRCLES ARE PROPORTIONAL TO PERCENTAGE DISTRIBUTION OF THROUGH TRUCKS.

proportion of the total truck traffic and lowest at points where commercial hauling was low in proportion to total truck traffic. Table 15 shows the distribution of the various classes of trucks according to gross weights.

Eighty-two trucks weighed more than 43,500 pounds. Twelve of these were found on U S 1, southwest of Greenwich; 29 on U S 1, east of Stratford; and 18 on U S 5 at Berlin. Thus, about seven-tenths of these trucks were in operation on routes between New York City and New Haven, or between New Haven and Hartford. Several of the heaviest trucks were also found on U S 5 north of Thompsonville, on U S 5A south of the State line, on U S 1 at Saybrook, and on Connecticut 8 at Naugatuck. Three-eighths of these trucks were owner-operated, the other five-eighths being commercial haulers. More than half of these heavy trucks were en route to or from New York City. Three-fourths were engaged in interstate traffic, one-fourth passing through the State, and one-half having one terminal in Connecticut and one outside. In almost every instance these trucks were owned by city residents and were operating between cities.

CHARACTERISTICS OF BUS TRAFFIC DISCUSSED

The distribution of busses according to the principal classifications indicates that more than 96 percent of all busses on Connecticut highways were owned by city residents; about 3 percent were owned by residents of villages or towns of less than 2,500 population; and less than 1 percent were owned by residents of farms. About 82 percent of all busses were traveling between cities; less than 2 percent ran from country to country; and about 16 percent were operating between city and country. Nearly 95 percent of all busses on Connecticut highways were common carriers, and contract-hauler busses were about 5 percent of the total. Tabulations of the origin and destination of individual busses show that 37 percent had both origin and destination in Connecticut; about 26 percent had one terminal in Connecticut and one outside; and 37 percent had both origin and destination in other States. Contract-hauler busses occurred most frequently in intrastate traffic, and least frequently in through traffic.

(Continued on p. 244)

TABLE 13.—*Destination of intercity truck traffic on Connecticut highways by class of operation*

Destination, city and county	Owner operator		Contract hauler		Common carrier		All classes	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Torrington, Litchfield	516	3.6	98	3.5	74	4.0	688	3.6
Bristol, Hartford	430	3.0	37	1.3	24	1.3	491	2.6
Hartford, Hartford	964	6.7	296	10.6	196	10.7	1,456	7.6
New Britain, Hartford	528	3.7	51	1.8	28	1.5	607	3.2
Bridgeport, Fairfield	3,598	25.0	732	26.2	426	23.2	4,756	25.0
Danbury, Fairfield	228	1.6	27	1.0	21	1.1	276	1.4
Greenwich, Fairfield	198	1.4	28	1.0	22	1.2	248	1.3
Norwalk, Fairfield	941	6.5	91	3.3	60	3.3	1,092	5.7
Stamford, Fairfield	1,286	8.9	124	4.5	130	7.1	1,540	8.1
Meriden, New Haven	444	3.1	48	1.7	16	.9	508	2.7
New Haven, New Haven	3,421	23.8	747	26.8	471	25.6	4,639	24.4
Waterbury, New Haven	818	5.7	215	7.7	157	8.5	1,190	6.3
Middletown, Middlesex	382	2.6	99	3.6	39	2.1	520	2.7
New London, New London	511	3.5	163	5.8	138	7.5	812	4.3
Norwich, New London	133	.9	34	1.2	36	2.0	203	1.1
Total, 15 cities	14,398	100.0	2,790	100.0	1,838	100.0	19,026	100.0
Percentage of intrastate truck traffic [1]		28.1		47.2		64.8		31.7

[1] The base figures for these percentages are found in table 10.

TABLE 14.—*Number and average gross weight of trucks passing designated points on Connecticut highways*

Location of station	Trucks weighed	Average gross weight
	Number	*Pounds*
U S 1, southwest of Greenwich	3,516	9,800
U S 1, east of Stratford	4,350	10,300
U S 1, at Saybrook	1,970	9,500
U S 7, northeast of Ridgefield	1,450	8,000
U S 5, at Berlin	3,513	11,100
U S 5, north of Thompsonville	1,854	10,100
U S 5A, south of State line	2,178	12,100
U S 6, at Plainville	2,463	7,600
Conn. 8, at Naugatuck	1,847	9,300
Conn. 12 and Conn. 14, north of Plainfield	1,749	8,100
Conn. 12 and Conn. 101, at Putnam	1,258	6,600
Total and average, 11 stations	26,148	9,600

TABLE 15.—*Distribution of trucks according to gross weight and by class of operation*

Gross weight, pounds	Owner operator		Contract hauler		Common carrier		All classes		Average gross weight, pounds
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	
Under 4,500	7,742	39.9	232	5.0	62	3.0	8,036	30.8	3,200
4,500 to 10,499	7,857	40.5	1,515	32.9	606	29.6	9,978	38.3	6,800
10,500 to 19,499	2,558	13.2	1,637	35.5	696	33.9	4,891	18.8	14,300
19,500 to 29,499	890	4.6	810	17.6	402	19.6	2,102	8.1	23,800
29,500 and over	358	1.8	414	9.0	285	13.9	1,057	4.0	36,700
Total, all weights	19,405	100.0	4,608	100.0	2,051	100.0	26,064	100.0	9,600
Average gross weight	7,600		15,200		17,000		9,600		

SOME CHARACTERISTICS OF HIGHWAY TRAFFIC IN RHODE ISLAND

BY THE DIVISION OF HIGHWAY TRANSPORT, BUREAU OF PUBLIC ROADS [1]

DURING the summer of 1934 a survey was conducted on the 725-mile State highway system of Rhode Island to obtain information on the distribution and classification of highway traffic, and the habits of drivers with regard to speed and obedience to traffic regulations. Work was done as a project of the Federal Emergency Relief Administration to furnish employment to many persons on relief rolls throughout the State. The sponsors were the Bureau of Public Roads, the State Board of Public Roads, the Department of State Police, and the Governor's Committee on Street and Highway Safety.

The field data were tabulated by 459 field enumerators at 355 observation stations during the period from June 29 to September 26, under the direction of 16 field supervisors. The administrative work and the compilation and analysis of data were done by a headquarters staff of 64 persons working from June 1 to December 20.

Insofar as possible, all data were classified as follows:

1. By weekdays and Sundays.
2. By hours of the day.
3. By location of the stations with reference to population as follows:

(*a*) Urban, the business centers of communities.

(*b*) Suburban, built-up areas predominantly residential.

(*c*) Rural, open country with houses or stores widely scattered.

It is important to note that only a few miles of the State highway system penetrate the boundaries of large cities, and hence the data obtained does not reflect city traffic conditions.

WEATHER CONDITIONS HAVE GREATEST EFFECT ON SUNDAY TRAFFIC

Observations of weekday and Sunday traffic at 135 stations showed that the Sunday traffic volume exceeded that of the average weekday by 42 percent. The hourly observations disclosed that the greatest traffic for the average weekday was from 5 to 6 p. m., with 7.54 percent of the total traffic volume for the day; and that the next busiest hour was from 8 to 9 p. m., with a nearly equal amount (7.52 percent). The weekday traffic volume dwindled to less than half of 1 percent between 4 and 5 a. m. On Sundays 8.05 percent of the day's traffic volume occurred between 7 and 8 p. m., and less than half of 1 percent occurred between 3 and 4 a. m.

Population density was found to have a definite effect on traffic. At urban stations the traffic volume rose to sharp peaks during the morning rush hour (8–9 a. m.), the late afternoon (5–6 p. m.), and the early evening (8–9 p. m.). Suburban stations showed the same characteristics, but not so strongly emphasized. At rural stations the volume was variable, increasing during the day because of through traffic, and with a peak only in the late afternoon (5–6 p. m.).

The influence of weather on traffic volume was made the subject of a special study carried on at five stations located on the principal routes between cities and coast resorts. Traffic volume was not noticeably affected by rainfall or excessive temperatures during the business hours of week days, but on hot Saturday afternoons and Sundays the volume was greatly increased. Heavy rain on a Sunday morning resulted in a concentration of most of the day's traffic in the afternoon hours, causing much congestion.

In determining the character of highway usage, data were recorded for 2,415,000 vehicles observed at 25 important intersections throughout the State. Counts were made of the numbers of passenger cars, busses, and trucks, the latter being subdivided by rated capacities. Table 1 shows the percentages of the three principal classes of vehicles according to place of registration.

TABLE 1.—*Classification of traffic by type of vehicle and place of registration*

Classification	Rhode Island	Foreign	Total
	Percent	*Percent*	*Percent*
Passenger cars	70.6	19.7	90.3
Trucks	7.3	1.4	8.7
Busses	.9	.1	1.0
Total	78.8	21.2	100.0

Passenger cars constituted over 90 percent of the total volume of traffic on the State highway system. During the summer of 1934, in addition to the usual summer attractions the presence of a naval fleet at Newport, horse races at Narragansett, and the international yacht cup races drew many visitors from other States. On the average week day 20.4 percent of the passenger cars were from outside the State, and on Sundays the percentage was 24.2.

Trucks constituted nearly 9 percent of the total traffic. The classification of trucks by rated capacity is shown in table 2. Truck traffic on Sundays was about 4 percent of the total traffic volume for the day, while on week days it constituted approximately 10 percent.

TABLE 2.—*Classification of trucks by rated capacity and place of registration*

Rated capacity	Rhode Island	Foreign	Total
	Percent	*Percent*	*Percent*
0 to 1½ tons, inclusive	49.6	5.8	55.4
1½ to 5 tons	25.0	5.2	30.2
5 tons and over	9.2	5.2	14.4
Total	83.8	16.2	100.0

AVERAGE SPEED OF VEHICLES FOUND TO BE 34 MILES PER HOUR

In this survey particular attention was given to the measurement of the speed of vehicles. Vehicles were timed by stop watches over a measured course and

[1] The full report has been submitted to the Rhode Island State Board of Public Roads and will not be published or distributed by the Bureau of Public Roads.

their speeds were computed. Nearly 675,000 vehicles were observed at 160 stations over five different periods aggregating 27 days. The average speed of all vehicles was found to be 33.8 miles per hour. Speeds of weekday and Sunday traffic by types of vehicles are shown in table 3.

Vehicle speeds were relatively high in the early morning business hours, and decreased sharply between 2 and 5 p. m. A marked increase in speed occurred between 5 and 7 p. m., and during the later evening hours the lowest speeds of the day were observed. The most striking decrease, of about 3 miles per hour, occurred at dusk. Speeds again rose to a peak in the small hours of the morning.

The effects of grades and curves and of weather conditions on vehicle speed, as far as could be determined from the data obtained in this study, were negligible. However, the observations were made on sections of road improved according to high standards of design and there were no sharp curves or steep grades.

Foreign cars traveled at speeds averaging 2.1 miles per hour faster than Rhode Island cars. Possibly this was because the drivers of foreign cars were making longer trips and were more concerned with saving time, or perhaps because they had newer or better-conditioned cars.

Unaccompanied drivers drove faster than the drivers with passengers by 1.3 miles per hour. There seemed to be no significant differences in the speeds of cars driven by men and those driven by women.

TABLE 3.—*Average vehicle speeds on week days and Sundays*

Classification	Week days	Sundays	Total
	Miles per hour	*Miles per hour*	*Miles per hour*
Passenger cars	34.4	33.5	34.2
Light trucks	31.2	31.1	31.2
Heavy trucks	28.4	29.4	28.4
Busses	30.5	30.1	30.4
Weighted average	33.9	33.4	33.8

A wide difference of opinion between the State police and the average driver as to safe speeds is indicated by the difference between the speeds observed and the speeds posted on the "safe speed" signs along certain roads by the State police. The percentage of drivers exceeding the posted limits ranged from 10.7 percent at 45-miles-per-hour signs to 86.1 percent at 20-miles-per-hour signs. Observations made at 13 stations showed that 37.7 percent of the drivers drove from 5 to 9 miles per hour faster than the signs indicated, and that 30 percent exceeded the limits by from 10 to 14 miles per hour. It should be noted, however, that under the present laws and regulations such signs are advisory only, and while the rather general disregard of their warnings may be considered as a challenge of the judgment used in placing the signs, it does not indicate a lack of control by the police.

MANY DRIVERS FAIL TO OBEY "STOP" SIGNS

A considerable part of the field work was devoted to the observation of driver habits with reference to traffic control devices. The results showed that 0.77 percent of the drivers and 41.7 percent of the pedestrians crossed intersections against red lights, and 14.1 percent of the pedestrians crossed diagonally.

Studies of observance of caution signals (flashing yellow lights suspended over intersections) were made at nine locations. Practically all vehicles approached the locality of these signals at speeds in excess of 15 miles per hour and were recorded as reducing speed to 15 miles per hour or as failing to reduce speed. The value of these observations is influenced by possible inaccuracies in estimating speed. The records show that 54.8 percent of the drivers on week days and 31.8 percent of the drivers on Sundays exceeded 15 miles per hour while passing the signals, even though at the stations where these counts were made there were 15 percent more drivers on Sunday than on the average weekday.

A study of "stop" sign observance showed that in this respect drivers of commercial vehicles were more careful than drivers of passenger cars. More than 220,000 drivers were observed during 1 week. They were classified as follows: (1) Made full stop; (2) almost stopped, that is, reduced speed to less than 3 miles per hour; (3) entered slow, 3 to 15 miles per hour; and (4) entered fast, over 15 miles per hour. A relatively small number, 6.6 percent, were in the fourth class. Table 4 contains a summary of the observations.

TABLE 4.—*Observance of "Stop" signs by different classes of traffic*

Driver's action	Passenger cars	Commercial vehicles	Total
	Percent	*Percent*	*Percent*
Made full stop	44.1	52.2	44.9
Almost stopped	29.1	27.4	28.9
Entered slow	20.0	15.9	19.6
Entered fast	6.8	4.5	6.6
Total	100.0	100.0	100.0

The percentage of obedience (vehicles made full stop or almost stopped) at urban and suburban stations was much higher than at rural stations, 80.9 percent as compared to 63.9 percent.

CURBS AND NARROW SHOULDERS FORCE TRAFFIC TOWARD CENTER OF ROAD

Rhode Island is probably the only State in which the entire State highway system and many town roads have traffic lanes marked with continuous 6-inch white lines on the road surface. During an 8-day period the behavior of over 622,000 drivers with respect to these lanes was observed, on 4-lane roads at 18 stations, on 3-lane roads at 3 stations, and on 2-lane roads at 23 stations. The results are shown in table 5, and represent lane observance on tangents.

The greater safety of four-lane roads was shown by the low percentage of vehicles driven on the wrong side of the road. However, the greater freedom of movement permitted by four lanes had an undesirable effect shown by the excessive straddling of lanes. Straddling decreased as the traffic volume increased, so it may be concluded that the lane markings are most effective when they are most needed, that is, when traffic is heaviest.

The effect of curbs and shoulders on the observance of traffic lanes was also studied. The observations indicate clearly that mental hazards caused by conditions along the roadside have a marked effect upon the

(Continued on p. 243)

AUTOMATIC PUMPING UNITS FOR UNDERPASSES

Reported by MARTIN DEUTERMAN, Junior Civil Engineer, Division of Bridges, Bureau of Public Roads

UNDERPASSES are sometimes used for the elimination of grade crossings in cities and other built-up sections where gravity drainage cannot be obtained. There are locations where an overpass would be built if the most effective way of serving highway traffic were the only factor considered, but other considerations such as the effect on values of adjacent property result in the selection of an underpass.

At some locations a clearance of 14 feet and satisfactory sight distances can be obtained only by placing the structures so that an automatic pumping unit is necessary or more economical than other methods of draining. When deciding between a pumping unit and other methods of draining, it should be borne in mind that if the pumping unit fails to operate during a rainstorm the underpass will be unusable.

Figure 1 shows four underpasses equipped with automatic pumping units.

CAREFUL DESIGN NECESSARY TO INSURE AUTOMATIC OPERATION

The drainage system and pumping unit should have ample capacity to care for all ground water that may be encountered. In many locations that appear dry on the surface ground-water streams are found during excavation. The drainage area served by the pumps may sometimes be reduced by the use of gravity sewers and ditches. In the design of catch-basin inlets intended to divert water from the underpass, special care is necessary to prevent water flowing with considerable velocity from passing by openings intended to intercept it and flowing into the drainage area served by the pumps. This can be prevented by lengthening and depressing the catch-basin opening more than usual. In the drainage system served by the pumping unit, the openings in the gratings over the catch-basin inlets should be small enough to catch all material too large to pass through the pumps. The roadway grades and catch-basin inlets should be designed so that no water stands in the roadway either during or after storms. The road surface should have a crown throughout the underpass and should not be "dished" for center drainage, because of the traffic hazard.

The pump may be placed in the sump or in a dry well adjacent to the sump. Where a dry well is used, the walls should be made as waterproof as practical and a small sump should be placed in the floor of the well. This small sump can be unwatered by a small suction pipe tapped to the main suction pipe, with hand-operated cut-off valves in both the main and small suction pipe.

The suction pipe should be placed below the floor of the sump with the floor of the sump sloping toward it. This arrangement has the advantage that sediment is not allowed to collect on the floor of the sump and the amount of water remaining after the pump cuts off is less. Sediment should not be allowed to collect on the floor of the sump, as it will interfere with the proper working of some types of automatic-control mechanisms. Water remaining in the sump may become a breeding place for mosquitoes. If no ground water reaches the sump between rains and it is practical to tap some nearby water supply, it is good practice to admit water to the sump at such rate as to cause the pump to operate every day or two. This will prevent the water from stagnating, and when the station is inspected the water flow can be increased so as to cause the equipment to operate. The equipment is less apt to stick if it is operated frequently than if it is allowed to stand idle for a long period of time.

The dry-well sump and the main sump may be kept dry between rains by drains in locations where the foundation soil affords suitable drainage.

Suction and discharge pipes of sufficient size and with large radius bends will reduce the friction load on the pump. A pipe 6 to 12 inches in diameter will usually be adequate. Separate supports for the discharge pipe at the floor of the sump or dry well and sometimes at the ceiling are necessary to reduce the eccentric load on the pump base. A check valve should be placed in the discharge line to prevent the water from running the motor backwards when the unit cuts off. If the gravity outfall sewer is located close to the pump house the friction head on the pump will be decreased. The size of the outfall pipe should be sufficient to carry the maximum output of the pumps without pressure. It is preferable to have the discharge pipe empty into a manhole, but if the discharge goes directly into the outfall pipe, a reducer long enough to prevent excessive turbulence should be used.

The pumping units usually used are the vertical centrifugal or turbine types designed for handling water conveying trash and suspended matter and capable of passing a sphere of a specified diameter. The specified diameter of the sphere is usually about 1 inch less than the diameter of the pump discharge for discharges up to 6 inches, and about 2 inches less for discharges over 6 inches. A unit will be required with a capacity at least great enough to discharge the maximum run-off of the drainage area into the gravity outlet against the maximum head, including friction head.

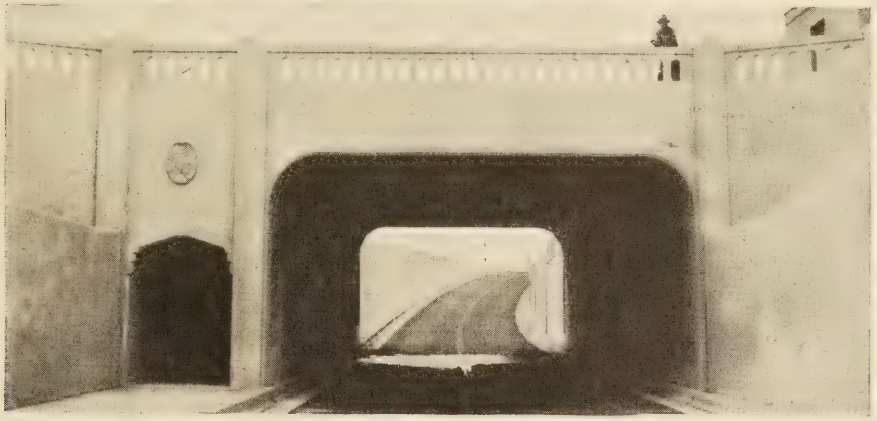
The pump should be of sturdy construction, made by a reliable manufacturer, and should be mounted on a rigid cast-iron base that can be bolted to a concrete foundation. A pump with parts easily accessible and removable will reduce the cost of cleaning, repairing, and replacement. The suction elbow should be supplied with an easily removable cleanout plug.

The shaft connecting the pump to the motor should be large enough to operate the pump at all times without whip or vibration. Lateral shaft supports should be placed at intervals of not more than 5 feet. The shaft should have a flexible connection at the pump and rigid connections at other joints. An additional flexible connection just below the motor will prevent any errors in alignment of the bearings from causing the motor to wobble.

CAREFUL ADJUSTMENT AND FREQUENT INSPECTIONS NECESSARY TO AVOID FAILURE DURING STORMS

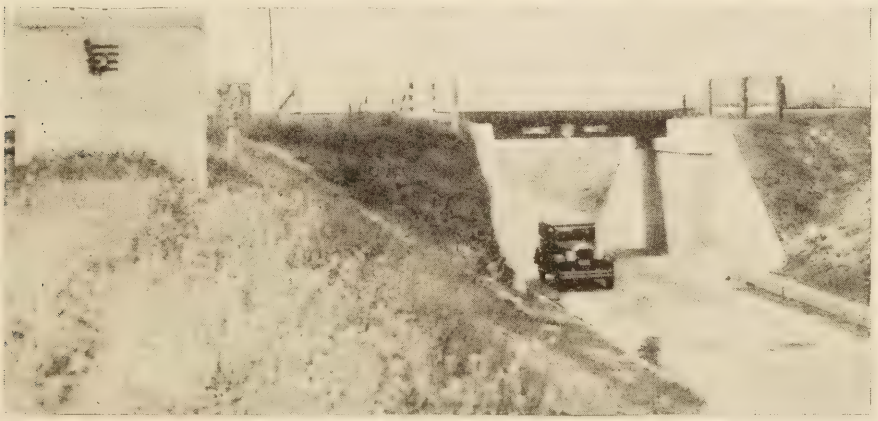
There should be a radial bearing in the motor, one in the pump, and one at each lateral support of the

An Underpass Under Construction in Bowie County, Tex. The Pump House is Under the Left Span.



An Underpass in Pinal County, Ariz.

An Underpass in Adams County, Nebr. The Pump House Is Behind the Right Abutment.



An Underpass in Harris County, Tex. The Pump House Is Shown in the Upper Left.

Figure 1.—Typical Underpasses Requiring Drainage by Pumping. Note Water Standing in Roadway in Three of the Pictures.

shaft. In addition, there should be a combination thrust and radial bearing in the motor to carry the weight of the revolving parts above the flexible connection, and also one in the pump to carry both the weight of the revolving parts below the flexible connection and the hydraulic thrust of the pump. If an additional flexible connection is used just below the motor, another thrust bearing will be required to carry the weight of the shaft. It is preferable to place this thrust bearing in the base of the motor. The bearings will require a lubrication system that will keep them bathed continuously in oil or grease, the lubrication system being serviced from the control house. With the pump in a dry well the pump bearings and the lowest shaft bearing should be capable of functioning properly while submerged. With the pump in a sump all the bearings that would be under water if the pumps failed to operate during a storm should be capable of functioning property while submerged.

The power unit should be a standard-make electric motor capable of starting and operating the pump under maximum load, without overheating, with the electrical power available. The motor should be of the vertical-shaft type, dust and dirt proof, and should have a rigid base for properly bolting it to the control-house floor. Undervoltage or overload protection should be provided. If two or more pumps are used an automatic alternator will be required that will transfer the operation from one pump to another or allow as many pumps to operate as are required to care for the water.

The automatic control device may be of the float, mercury-switch, or any other type that will give satisfactory service. The device should be set to start the motor after the water is high enough to prime the pump and to stop the motor when the water surface is as low as it can be gotten with the automatic device used or before it reaches the intake of the suction pipe. The adjustments of the control device should be such that it could be set to start and stop the motor at any desired head of water in the sump within practical limits. In the float type of control sediment accumulating under the float may prevent it from getting low enough to cut off the motor. Sediment accumulated around the lower end of the tube that actuates the mercury-switch type of control may prevent a change in pressure in the tube and may cause the device to fail to operate. A manually operated switch should be installed in addition to the automatic switch.

The control house, sump, and dry well should be constructed with doors, windows, trap doors, manholes, and ladders arranged so as to facilitate installation, inspection, and repair of the pumping unit and fittings. The control room should be ventilated with louvers in opposite walls. The elevation of the control room should be such that if the pump fails to operate the room will not be flooded.

The plans and specifications for the equipment and installation should be prepared by a competent engineer. The plans should show the general construction and sectional views of the pump together with characteristic curves showing capacity, efficiency, brake horsepower, and other data necessary to determine the quality of the materials used and the fitness of the apparatus for the service intended.

All electrical equipment and installations should conform to the code of the National Board of Fire Underwriters.

After completion of the installation in every detail, it should be tested by filling the sump and allowing the unit to operate as planned. This test should be repeated until all defects are corrected and adjustments made. It is advisable to make acceptance of the station subject to satisfactory performance during these tests.

Regular inspections should be made to insure the proper operation of an automatic pumping station.

Table 1 lists pertinent data for a number of pumping-station installations.

In May 1935 reports were made to the Texas State Highway Department by its division engineers on the functioning and adequacy of installations made in recent years. These reports gave the following data for some of the Texas projects listed in table 1.

NRM 474, Bowie County.—The type of control that requires that the bottom of the sump house be kept perfectly clean and free from mud is unsatisfactory. Very often the mud is not cleaned out and the switch fails to operate.

The pump operates properly, but during heavy rainstorms the underpass has been flooded to a depth of about 3 feet, closing the underpass to traffic. The pump lacks the capacity to dispose of the water fast enough during heavy rains.

The sewer inlets at a nearby street intersection do not carry as much water as they might, because of the grade of the street and the size of the grate openings. If the grates could be replaced by grates with larger openings, much more water would be diverted from the pump house.

NRM 417–E, Colorado County.—The unit has operated satisfactorily with one exception when power service was interrupted by an electrical storm. The equipment has been given several very thorough tests during heavy rain storms.

The pumping unit has a sump and dry well separated by a concrete wall. The intake of the pump is placed higher than the bottom of the sump, and the electrical starting and stopping device is so set that the pump does not start until there is approximately 28 inches of water in the sump, or sufficient water to prime the pump. After the pump has stopped this water remains in the sump and deposits silt on the bottom. In future installations the intake of the pump should be placed below the elevation of the sump and the bottom portion of the sump should be constructed so as to form a tapered section or funnel shape. This would cause any sediment that might be deposited in the sump to be carried out through the pump. In this way the sump would be dry except during rain storms and the pump would prime itself as soon as sufficient rain water accumulated.

SP 973–B, Fort Bend County; NRM 512–J, Harris County; FAP 514–D, Harris County; FAP 565–B, Harris County; and *NRM 535–E, Harris County.*—When these pumping units were first installed, it was difficult to adjust the automatic control mechanisms properly. Only after 3 to 4 hard rains were the adjustments properly made. After the equipment was once properly adjusted, it seldom failed to work and then failure was usually caused by lightning or wind causing current failure. These pumping units have adequately handled the rain water from all storms that have occurred since installation of the pumps.

SP 873–B, unit 3, Navarro County.—This pumping unit has functioned properly and has given satisfactory service.

TABLE 1.—*Typical pumping-station installations*

Project location and no.	Date of contract or estimate	Type of motor	Size of pump	Cost of equipment	Cost of maintenance
Bowie County, Tex., NRM 474.	Feb. 12, 1934	7½-horsepower, 3-phase, 60-cycle, 220-volt. Self-contained oiling system. Mercury switch control.	1,000 gallons per minute against 11-foot head, 6-inch vertical centrifugal type with 8-inch suction and capable of passing a 4-inch sphere.	$1,500. Includes sump, motor house, pump, motor, and other appurtenances required for receiving and discharging water.	Minimum rate $1 per month. In last 5 months meter has registered 109 kilowatt-hours at $0.02 per kilowatt-hour, 1 gallon of oil and 1 quart of compression grease bought in April 1935.
Colorado County, Tex., NRM 417-E.	do	7½-horsepower, 3-phase, 60-cycle, 220-volt. Self-contained oiling system. Mercury switch control.	700 gallons per minute against 21-foot head, 6-inch vertical centrifugal type with 8-inch suction and capable of passing a 4-inch sphere.	$2,000. Includes pump, motor, and other appurtenances required for receiving and discharging water.	Average cost, $8.50 per month.
Fort Bend County, Tex., SP 973-B.	Feb. 19, 1934	15-horsepower, 3-phase, 60-cycle, 220-volt. Self-contained oiling system. Float control.	1,000 gallons per minute against 23-foot head, 5-inch vertical centrifugal type with 6-inch suction and capable of passing a 4-inch sphere.	$2,100. Includes pump, motor, switch floats, pipes and fittings connected with pump, and motor.	Average cost, $21 per month.
Harris County, Tex., NRM 512-J.	Installed in 1932	15-horsepower. Mercury switch control.	1,000 gallons per minute against 33-foot head.	$3,000. Estimated replacement cost.	Do.
Harris County, Tex., FAP 514-D.	Feb. 27, 1931	15-horsepower, 3-phase, 60-cycle, 220-volt. Self-contained oiling system. Float control.	1,000 gallons per minute against 22½-foot head, 5-inch vertical centrifugal type with 6-inch suction and capable of passing a 4-inch sphere.	$2,660. Includes motor, motor house, pump, well, and sump.	Do.
Harris County, Tex., FAP 565-B.	Aug. 1, 1931	15-horsepower, 3-phase, 60-cycle, 220-volt. Self-contained oiling system. Mercury switch control.	1,000 gallons per minute against 22½-foot head, 5-inch vertical centrifugal type with 6-inch suction and capable of passing a 4-inch sphere.	Manhole covers $57, automatic pump unit $2,400, motor-house door $15, cost of well and other work $3,338, total $5,810.	Do.
Harris County, Tex., NRM 535-E.	Jan. 8, 1934	20-horsepower, 3-phase, 60-cycle, 220-volt. Self-contained oiling system. Mercury switch control.	2,000 gallons per minute against 20-foot head, 6-inch vertical centrifugal type with 8-inch suction and capable of passing a 4-inch sphere.	Motor house, dry well, and sump $2,100, automatic pumping unit $2,150, total $4,250.	Division engineer did not make a report of cost; $23 per month assumed to be in line with costs of other installations in same division.
Navarro County, Tex., SP 873-B unit 3.	Sept. 21, 1931	15-horsepower, 3-phase, 60-cycle, 220-volt. Self-contained oiling system. Float control.	1,000 gallons per minute against 20-foot head, 5-inch vertical centrifugal type with 6-inch suction and capable of passing a 4-inch sphere.	Automatic drainage unit $1,850, well and other work $2,095, total $3,945.	Average cost $13 per month.
Taylor County, Tex., NRM 581.	Contract not awarded to date.	25-horsepower, 3-phase, 60-cycle, 220-volt. Self-contained oiling system. Mercury switch control.[1]	3,000 gallons per minute against 24-foot head, 8-inch vertical centrifugal type with 8-inch suction and capable of passing a 4-inch sphere.	Automatic pumping unit $3,000, motor house $350, concrete for dry well $1,126, total $4,476.	
Pinal County, Ariz., NRS 100-C.	Jan. 23, 1935 (date of estimate).	2 motors, 3-horsepower each, 40° rating, line start, induction, 3-phase, 60-cycle, 220-volt. Motor, shaft, and pump lubricated by electrically operated automatic oiler. Float control.	2 at 250 gallons per minute each against 35-foot head (static 20 feet, friction 15 feet). 4-inch vertical centrifugal or turbine type capable of passing a 3-inch sphere.	$3,100. Includes pump house, sump, dry well, and equipment in place.	
Adams County, Nebr., NRM 169-B.	Mar. 16, 1934	20-horsepower, 3-phase, 60-cycle, 220-volt. Induction type. Float control.	1,500 gallons per minute against 20-foot head at 850 revolutions per minute, vertical, single-stage, open-impeller type. 8-inch suction and discharge capable of passing a 2-inch sphere. Pump suspended by discharge pipe and pipe enclosing shaft.	Pump house $808, pump and electric wiring $3,600, total $4,408.	

[1] This particular installation will not be made but the data are given as being typical.

(Continued from p. 239)

TABLE 5.—*Lane observance on tangents*

Driver's action	4-lane roads	3-lane roads	2-lane roads
	Percent	*Percent*	*Percent*
Drove in first lane	57.5	84.7	92.8
Straddled line	29.3	9.1	
Drove in second lane	11.9	6.2	
Drove left of center line	1.3		7.2
Total	100.0	100.0	100.0

TABLE 6.—*Traffic classified by lane observance on hills and curves*

Roads	Stayed in first lane		Crossed center but did not pass		Passed other vehicles	
	Hills	Curves	Hills	Curves	Hills	Curves
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
2-lane	93.4	93.7	2.8	4.8	3.8	1.5
3-lane	88.9	73.1	2.4	24.3	8.7	2.6
Combined	92.5	89.8	2.7	8.5	4.8	1.7

driver. Wide shoulders induced traffic to stay in the outside lanes; narrow shoulders increased the tendency to straddle; and permanent raised curbs not only caused straddling, but tended to cause the motorists to drive completely out of the correct lanes.

The dangerous practice of passing on hills and curves was studied during two periods of 6 and 4 days each, 269,000 drivers being observed at 13 hill and 13 curve stations on 2- and 3-lane roads. The results are summarized in table 6.

NEARLY ALL VEHICLES FOUND TO OBSERVE VEHICLE LIGHT REQUIREMENTS

Rhode Island regulations require that every motor vehicle must show 2 headlights and 1 taillight beginning one-half hour after sunset. Observations were made for 8 successive days during the hours from 8 to 10 p. m. Of the 79,200 cars observed, only 3.5 percent violated this law in any degree. The results of this study are shown in table 7.

The greatest percentage of cases where no headlights were shown occurred during the hour from 8 to 9 p. m.,

TABLE 7.—*Traffic classified by lights displayed during different intervals at night*

Lights displayed		8 to 9 p. m.	9 to 10 p. m.	Total 8 to 10 p. m.
Head	Tail	*Percent*	*Percent*	*Percent*
2	1	95.27	98.13	96.47
2	0	1.75	1.42	1.61
1	1	.61	.39	.52
1	0	.06	.02	.04
0	1	.77	.02	.46
0	0	1.54	.02	.90
Total.		100.00	100.00	100.00

indicating that some of the drivers were slow in turning on their lights.

Drivers observed at urban and suburban stations made a much better record than those passing rural stations, as may be seen from the following percentages of lighting violations: Urban, 2.7 percent; suburban, 2.6 percent; and rural, 4.3 percent.

The survey's value as an unemployment relief project is shown in the cost figures. The total cost of the survey was $89,961.76, and of this sum $85,342.49, or 94.87 percent, were paid as wages and salaries. The employment provided aggregated 159,135 man-hours.

(Continued from p. 237)

Traffic volume at 54 points on the Connecticut highway system increased 255 percent between the traffic surveys in 1922–23 and 1933–34, exceeding the rate of increase in gasoline consumption over the same period. Traffic has increased more rapidly on the State highway system than upon all roads in the State. New and shorter routes with better pavement and alinement, longer sight distances, and easier grades have caused some shifting of traffic from old routes, but in no instance is a State route carrying less traffic at present than it carried during the 1922–23 traffic survey.

A total of 1,786 miles of trunk-line and State-aid highways have been classified on the basis of present traffic as follows: Sections carrying 1,500 or more vehicles per day, major class; sections carrying 500 to 1,499 vehicles per day, medium class; and sections carrying less than 500 vehicles per day, minor class. Almost 913 miles, or 51 percent, are in the major class; 660 miles, or 37 percent, are in the medium class; and 213 miles, or 12 percent, are in the minor class.

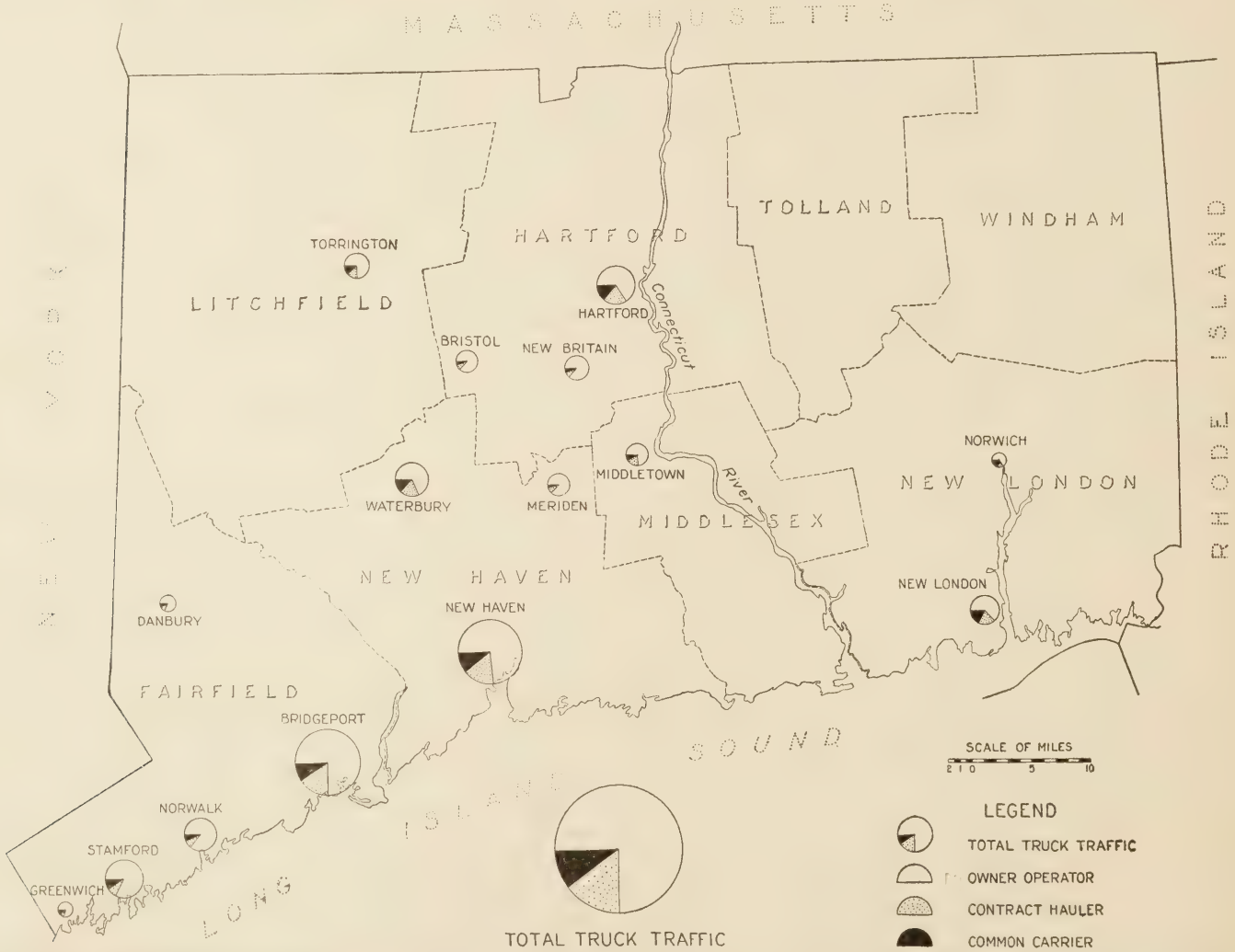


FIGURE 14.—DISTRIBUTION OF INTER-CITY TRUCK TRAFFIC TERMINATING IN 15 PRINCIPAL CITIES OF CONNECTICUT, BY CLASS OF OPERATION. AREAS OF CIRCLES ARE PROPORTIONAL TO PERCENTAGE DISTRIBUTION OF TOTAL TRUCK TRAFFIC BETWEEN THESE 15 CITIES.

COMPLETE CANVASS OF MOTOR-VEHICLE TRANSPORTATION TO BE MADE

By Ralph L. Dewey, Chief, Transportation and Communications Divisions, Census of Business

The Census of Business, covering the calendar year 1935, enumeration for which began January 2, 1936, is the most comprehensive project of its kind ever undertaken, and will for the first time include motor-vehicle operations for hire.

Comparable projects have been completed in other years, but they were limited. In 1930, a census of distribution covering 1929, was taken. In 1934 a census of American business for 1933 was made, but it was limited to distribution, service businesses, amusement enterprises, and hotels.

The rapid change in our entire economic structure has created a demand on the part of business leaders for more complete data concerning the activities of American business. Requests from business men and chambers of commerce determined the scope of the work. Representative organizations in all business fields are working with the Census Bureau to make the project of maximum value.

KIND OF MOTOR TRANSPORTATION INFORMATION TO BE COLLECTED

Kind of business.—A complete canvass of commercial motor-vehicle transportation will be made. This will include both the transportation of commodities and persons. Both freight and passenger carriers will be classified as doing either a local, intrastate, or interstate business. The area covered will determine the classification of a given carrier. A local carrier will be one operating within a given city and the immediately surrounding area, even though a State line may be crossed. Operations between Philadelphia, Pa., and Camden, N. J., Chicago, Ill., and Whiting, Ind., Cincinnati, Ohio, and Covington, Ky., and similar operations will be considered local. A distinction will also be made between contract and common carriers for both bus and truck operators.

Operating revenue and expenses.—Data for total operating revenue and expenses of commercial motor-vehicle operators for 1935 will be collected. Revenue will be classified according to the type of services rendered. Thus revenue received from warehousing and storage, terminal operations, transportation of persons, transportation of commodities, etc., will be listed separately. Expenses will not be allocated on the same basis but rather collected in terms of total expenses for the year. Pay-roll data, however, will be collected separately from all other operating expenses.

Detailed employment data for a sample week (that ending nearest Oct. 26, 1935) will be collected. These will include the number of full-time and part-time employees and the pay rolls for each. Employees will be classified in terms of functions performed such as office and clerical, warehousing and platform, transportation crews, maintenance, servicing, etc.

Inventory of equipment.—A complete inventory of equipment will be obtained. In the case of trucks the number and age of trucks, semitrailers, trailers, and tractors in operation or available for operation in October 1935 will be listed. The first three of these types will be classified by capacities. For motorbusses the number and age of sightseeing, school, and other busses will be obtained. These will be grouped according to capacities.

Value of the survey.—The survey of the motor transportation-for-hire business will be only one aspect of the 1935 Census of Business. Other business enterprises covered by this census will include:

Retail trade.
Wholesale trade.
Construction.
Hotels.
Amusements.
Business services.
Operation of nonresidential buildings.
Advertising agencies.
Nonprofit organizations.
Warehousing.
Broadcasting.
Distribution of manufacturers' sales (channels of primary distribution).
Insurance (carriers, agents, and brokers).
Real estate (agents and brokers).
Banking and finance.

For all these fields of business endeavor the number of establishments, sales, number of employees, pay rolls, etc., will be obtained. All such data will be collected and published by important geographical areas. The position of motor transportation in this picture will be readily ascertainable. A careful analysis of these data should provide a partial index to motor transportation possibilities in given areas. The transportation industry should be highly interested in obtaining an accurate picture of the character and extent of commercial motor-vehicle transportation.

Many values of this survey will prove themselves as the data are collected and made public. While absolutely no information will be given out which will disclose the identity of any individual operator, the combined reports of a number of operators in a given territory will provide an excellent statistical picture of the industry. These data can be coordinated and correlated with the information received from other parts of the Census of Business Survey.

Field work for the census began January 2, 1936. Headquarters for the project have been set up in Philadelphia, where Fred A. Gosnell, experienced head of the previous business census, is chief statistician in charge.

Only sworn employees of the Bureau of the Census are permitted to examine the individual returns. No access to them is permitted under the law, not even to other governmental agencies, and no information will be disclosed which would reveal any of the facts or figures in the returns.

Such a complete survey of business could not be more timely and useful than the one covering 1935. Every effort will be made to expedite reports so as to make available the maximum useful information with a minimum of delay.

The field work will be completed within 3 months after the enumeration starts. The first preliminary report of basic facts, by States, will be issued about July 1, 1936. Soon after the State reports are completed, special statistics for retail trade will be released as rapidly as possible.

CURRENT STATUS OF FEDERAL-AID HIGHWAY PROJECTS

(1936 FUNDS ONLY)

AS OF DECEMBER 31, 1935.

STATE	APPORTIONMENT	COMPLETED			UNDER CONSTRUCTION			APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS
		Estimated Total Cost	FEDERAL AID	Miles	Estimated Total Cost	FEDERAL AID	Miles	Estimated Total Cost	FEDERAL AID	Miles	
Alabama	2,604,320										2,604,320
Arizona	1,781,347				1,489,399	1,230,652	91.1	406,813	320,205	10.1	230,490
Arkansas	2,142,723										2,142,723
California	4,756,959				2,992,047	1,726,449	38.9	320,279	181,106	7.0	2,849,404
Colorado	2,288,811				1,081,206	605,491	45.6	900,777	504,435	37.6	1,178,885
Connecticut	791,253										791,253
Delaware	609,375							422,476	209,443	38.2	399,932
Florida	1,655,723				674,678	337,339	23.8	218,968	109,484	8.7	1,208,900
Georgia	3,168,221				596,164	298,082	36.8	1,290,511	639,030	74.9	2,231,109
Idaho	1,531,162	305,432	172,421	44.6	994,494	593,012	95.0	64,242	38,443	6.0	727,286
Illinois	5,160,696				2,548,483	1,274,241	54.4	3,201,534	1,600,767	55.0	2,285,688
Indiana	3,087,613	216,137	108,068	6.9	3,044,219	1,518,253	93.7	2,120,741	1,060,271	49.9	401,021
Iowa	3,231,718	84,196	39,510	21.0	3,885,848	1,830,615	203.4	2,088,229	984,158	80.7	377,435
Kansas	3,317,054				365,452	182,726	96.2	2,450,186	1,225,093	268.3	1,909,235
Kentucky	2,304,143				1,995,762	978,299	130.1	1,347,108	637,649	50.5	688,195
Louisiana	1,776,939				849,060	424,530	32.0	1,308,524	654,262	44.5	698,147
Maine	1,090,167	113,605	56,803	2.1	1,597,412	798,705	49.6	99,529	49,765	1.9	184,894
Maryland	1,025,870										1,025,870
Massachusetts	1,741,877										1,741,877
Michigan	3,837,292	722,100	361,050	20.7	3,201,374	1,597,962	131.1	1,574,450	787,225	66.5	1,091,055
Minnesota	3,423,306	334,238	143,116	12.2	2,569,078	1,062,579	141.6	1,041,761	396,720	73.2	1,820,891
Mississippi	2,196,524										2,196,524
Missouri	3,800,856	1,171,810	585,905	220.8	2,615,159	1,307,580	104.7	924,387	462,193	42.9	1,445,178
Montana	2,560,449	558,560	312,738	131.1	1,071,574	599,974	95.1	227,137	127,174	13.8	1,520,563
Nebraska	2,581,663	983,386	491,693	61.4	739,320	369,660	73.2	11,828	5,914	5.2	1,714,396
Nevada	1,595,501	121,853	105,488	55.4	883,442	764,796	95.8				725,217
New Hampshire	609,375				696,758	341,926	18.1	122,782	61,341	3.8	206,108
New Jersey	1,675,751	37,143	18,572	.8	1,286,489	643,244	23.4	2,090,803	997,177	16.2	16,758
New Mexico	1,999,299	67,052	40,781	10.9	1,152,918	701,204	103.2	822,657	500,340	49.2	756,974
New York	6,150,106				7,023,455	3,497,900	130.6	2,695,250	1,302,600	41.5	1,349,606
North Carolina	2,938,657				1,091,425	545,712	183.5	75,887	37,944	15.1	2,355,001
North Dakota	1,960,162										1,960,162
Ohio	4,565,435				449,762	224,782	4.7	2,684,400	1,341,200	35.5	2,999,453
Oklahoma	2,947,521				1,498,396	787,407	50.5	335,155	176,124	11.6	1,983,990
Oregon	2,044,633				2,181,086	1,323,308	86.5	255,447	149,075	4.2	572,250
Pennsylvania	5,348,062	18,018	9,009	.5	3,142,790	1,571,395	47.2	2,992,143	1,495,817	41.7	2,271,841
Rhode Island	609,375										609,375
South Carolina	1,692,896										1,692,896
South Dakota	2,036,775				516,746	283,332	35.2	67,989	37,278	9.9	1,716,165
Tennessee	2,638,159				834,404	417,202	40.5	511,461	255,730	18.4	1,965,227
Texas	7,777,504	3,545	1,700	.3	4,948,085	2,456,912	290.4	2,424,916	1,204,039	120.9	4,114,853
Utah	1,410,752	267,727	193,299	17.0	505,349	364,862	46.8	41,334	29,843	3.3	822,748
Vermont	609,375	25,988	12,994	2.9	1,109,330	554,626	51.3	52,043	26,021	4.7	15,734
Virginia	2,278,475				53,810	26,905	1.5	1,224,568	612,284	44.2	1,639,286
Washington	1,949,957	637,524	335,800	18.8	946,043	498,700	40.3	859,991	451,049	11.7	664,408
West Virginia	1,356,793	87,161	43,581	3.0	493,994	246,997	29.1	58,840	29,420	.2	1,036,795
Wisconsin	3,045,557	230,339	115,169	4.8	1,030,747	501,912	52.5	699,444	330,939	27.5	2,097,537
Wyoming	1,559,444	509,889	314,034	82.2	1,860,381	1,145,789	174.6	140,744	86,683	17.9	12,938
District of Columbia											
Hawaii	609,375							234,328	116,892	2.5	492,483
TOTALS	121,875,000	6,495,703	3,461,731	717.4	64,016,139	33,635,060	3,042.0	38,409,662	19,235,133	1,414.9	65,543,076

CURRENT STATUS OF UNITED STATES WORKS PROGRAM HIGHWAY PROJECTS

(AS PROVIDED BY THE EMERGENCY RELIEF APPROPRIATION ACT OF 1935)

AS OF DECEMBER 31, 1935.

STATE	APPORTIONMENT	COMPLETED			UNDER CONSTRUCTION			APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS
		Estimated Total Cost	Works Program Funds	Miles	Estimated Total Cost	Works Program Funds	Miles	Estimated Total Cost	Works Program Funds	Miles	
Alabama	4,151,115				615,359	615,359	24.9	2,732,155	2,732,155	79.8	803,601
Arizona	2,569,841				917,399	897,436	59.8	697,097	624,074	45.1	1,048,331
Arkansas	3,352,061				646,613	645,439	50.1	1,207,825	1,206,181	93.1	1,500,441
California	7,747,928				410,823	383,416	18.2	4,773,890	4,553,271	175.4	2,811,241
Colorado	3,395,263				586,514	586,124	48.0	494,445	494,445	20.5	2,314,695
Connecticut	1,418,709										1,418,709
Delaware	900,310							445,616	445,616	41.6	454,694
Florida	2,597,144				415,255	415,255	9.3	736,132	736,132	30.6	1,445,757
Georgia	4,988,967							483,241	483,241	29.0	4,505,726
Idaho	2,222,747				454,462	440,137	36.0	627,088	579,472	57.4	1,203,138
Illinois	8,694,009				1,695,208	1,695,208	71.4	2,983,335	2,983,335	220.1	4,015,466
Indiana	4,941,255				575,619	575,619	34.9	2,222,608	2,222,608	121.5	2,143,027
Iowa	4,991,664				606,289	579,265	43.0	776,237	734,561	158.2	3,677,838
Kansas	4,994,975				1,369,331	1,369,331	125.9	1,170,415	1,169,415	144.6	2,456,229
Kentucky	3,726,271				404,188	404,188	69.9	1,895,466	1,854,501	220.4	1,467,582
Louisiana	2,890,429				33,366	33,348	7.8	1,436,098	1,051,963	148.0	1,805,118
Maine	1,676,799				678,316	678,316	32.5	539,948	539,948	23.3	458,535
Maryland	1,750,738							155,922	155,922	6.8	1,594,816
Massachusetts	3,262,885										3,262,885
Michigan	6,301,414	359,350	359,350	14.8	4,212,921	4,212,921	210.1	1,538,700	1,485,690	55.3	243,453
Minnesota	5,277,145	33,934	33,934	32.3	645,335	577,904	64.4	1,547,198	1,414,970	287.7	3,250,337
Mississippi	3,457,552				557,303	554,918	26.3	1,463,535	1,463,535	93.7	1,439,099
Missouri	6,012,652	4,869	4,869	8.6	1,161,329	1,161,329	243.4	2,120,067	2,120,067	436.9	2,726,387
Montana	3,676,416				915,096	915,096	46.0	1,661,587	1,661,587	113.2	1,099,733
Nebraska	3,870,739				848,451	848,451	81.0	1,457,904	1,425,453	141.3	1,596,834
Nevada	2,243,074				808,944	803,944	31.6	548,193	541,193	20.7	897,937
New Hampshire	945,225				167,186	165,277	6.2	100,215	99,978	3.0	679,970
New Jersey	3,129,805				448,969	448,969	6.7	1,249,006	1,249,006	6.2	1,431,830
New Mexico	2,871,397				558,106	558,106	53.0	443,483	443,483	39.0	1,869,808
New York	11,046,377				3,353,738	3,312,448	30.0	1,909,480	1,734,169	23.5	5,999,760
North Carolina	4,720,173				532,735	532,735	47.8	870,159	870,159	81.8	3,317,279
North Dakota	2,867,245	70,277	70,277	9.1	339,049	339,049	53.8	68,375	68,375	8.7	2,389,544
Ohio	7,670,815				877,612	877,612	7.5	1,253,000	1,253,000	14.4	5,540,203
Oklahoma	4,580,670				158,049	158,049	13.8	2,047,973	2,047,923	203.8	2,374,698
Oregon	3,038,642				819,430	819,430	25.2	1,101,639	1,077,374	84.0	1,141,838
Pennsylvania	9,347,797				156,356	156,356	.1	477,010	477,010	25.1	8,714,431
Rhode Island	989,208				39,916	39,916		171,277	171,277	7.2	778,016
South Carolina	2,702,012				296,459	296,459	25.2	145,383	145,383	17.3	2,260,171
South Dakota	2,976,454	79,686	79,686	30.1	428,618	428,618	125.2	314,898	314,898	77.8	2,153,251
Tennessee	4,192,460				338,156	338,156	18.2	559,491	559,491	20.7	3,294,814
Texas	11,989,350				2,511,258	2,402,296	218.4	3,766,930	3,671,784	336.2	5,915,271
Utah	2,067,154				365,218	348,599	29.0	467,154	397,770	41.9	1,320,784
Vermont	924,306				136,368	135,438	4.9	334,086	332,086	8.7	456,783
Virginia	3,652,667	29,453	29,453	14.9	534,678	534,678	391.4	766,459	766,459	269.4	2,322,077
Washington	3,026,161				1,072,862	1,017,886	38.5	1,005,009	927,269	71.2	1,081,005
West Virginia	2,231,412				577,056	577,056	30.8	204,515	194,118	7.3	1,460,237
Wisconsin	4,823,884				991,554	763,411	54.1	1,354,914	1,230,158	97.5	2,830,315
Wyoming	2,219,155				386,988	386,986	16.6	584,406	584,404	35.8	1,247,765
District of Columbia	949,496	95,395	95,395	.9	528,670	528,670	4.2	104,152	95,816	.9	229,615
Hawaii	926,033							196,335	195,477	1.7	730,556
TOTALS	195,000,000	672,964	672,964	110.7	34,177,152	33,559,204	2,535.1	53,210,051	51,586,202	4,247.3	109,181,630

CURRENT STATUS OF UNITED STATES WORKS PROGRAM GRADE CROSSING PROJECTS

(AS PROVIDED BY THE EMERGENCY RELIEF APPROPRIATION ACT OF 1935)

AS OF DECEMBER 31, 1935.

STATE	APPORTIONMENT	COMPLETED				UNDER CONSTRUCTION				APPROVED FOR CONSTRUCTION				BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS
		Estimated Total Cost	Works Program Funds	NUMBER		Estimated Total Cost	Works Program Funds	NUMBER		Estimated Total Cost	Works Program Funds	NUMBER		
				Eliminated by Separation or Relocation	Protected By Signals or Otherwise			Eliminated by Separation or Relocation	Protected By Signals or Otherwise			Eliminated by Separation or Relocation	Protected By Signals or Otherwise	
Alabama	4,034,617					832,793	832,793	10		1,877,056	1,877,056	21	1	1,324,768
Arizona	1,256,099					50,000	50,000	1						1,206,099
Arkansas	3,574,060					187,657	187,107	5		981,842	979,533	23		2,407,420
California	7,486,362					403,012	392,165	2		5,573,413	5,355,599	32		1,738,599
Colorado	2,631,567					292,247	291,952	8		649,815	628,815	8		1,710,800
Connecticut	1,712,684													1,712,684
Delaware	418,239													418,239
Florida	2,827,883					644,152	644,152	6		481,323	481,323	4		1,702,409
Georgia	4,895,949													4,895,949
Idaho	1,674,479					378,051	355,875	6		303,886	281,540	5		1,037,064
Illinois	10,307,184					256,055	256,055	1		1,572,155	1,572,155	27		8,478,973
Indiana	5,111,096					1,112,975	1,112,975	3		1,545,566	1,545,565	14		2,452,556
Iowa	5,600,679					711,579	682,150	10		531,363	507,000	14		4,411,529
Kansas	5,246,258					78,694	78,694			1,187,871	1,187,871	19		3,979,693
Kentucky	3,672,387									2,603,670	2,050,829	19		1,621,558
Louisiana	3,213,467									1,190,482	931,000	11		2,282,467
Maine	1,426,861					79,488	79,013	1		290,180	290,180	4		1,057,668
Maryland	2,061,751									505,309	505,309	4		1,556,442
Massachusetts	4,210,833					393,711	393,711	2		363,286	363,286	1		3,453,836
Michigan	6,765,197					2,669,602	2,669,602	32		2,059,050	2,059,050	11		2,036,545
Minnesota	5,395,441					166,201	166,201	4		768,418	762,368	17	1	4,466,872
Mississippi	3,241,475					169,000	169,000	2		828,003	828,003	16		2,244,472
Missouri	6,142,153					203,387	203,387	2		637,243	637,243	8		5,301,523
Montana	2,722,327					591,772	591,772	10		1,091,070	1,091,070	23		1,039,485
Nebraska	3,556,441					271,757	271,757	15		1,492,712	1,492,712	40		1,791,972
Nevada	887,260					306,096	306,096	7		13,308	13,308			567,856
New Hampshire	822,484									140,766	140,766			681,718
New Jersey	3,983,826													3,983,826
New Mexico	1,725,286									571,042	557,215	9		1,168,071
New York	13,577,189					2,388,410	2,285,110	5		1,243,200	1,243,200	4		10,048,879
North Carolina	4,823,958					256,915	256,915	1		535,468	535,468	9		4,031,575
North Dakota	3,207,473					39,335	39,335	2		133,902	133,902	3		3,034,236
Ohio	8,439,897					126,598	126,598							8,313,298
Oklahoma	5,004,711					468,772	468,772	9		1,140,614	1,135,614	19		3,400,324
Oregon	2,334,204					502,229	501,102	3		293,978	293,344	2		1,539,758
Pennsylvania	11,483,613					219,670	203,527	5		418,400	373,900	11		10,906,186
Rhode Island	699,691					236,879	236,879							462,812
South Carolina	3,059,956					129,616	129,616	3		404,313	404,313	10		2,526,028
South Dakota	3,249,086					123,822	123,822	3		51,774	51,774	1		3,073,490
Tennessee	3,903,979					78,679	78,679	1		273,217	273,217	5		3,552,083
Texas	10,855,982					92,057	92,057	4		2,079,257	2,069,803	31		8,694,122
Utah	1,230,763					128,602	128,602	1		224,536	218,672	4		833,489
Vermont	729,857					307,976	306,617	3		167,609	167,609	4		255,631
Virginia	3,774,287					24,928	24,928	1		184,573	184,573	5		3,564,786
Washington	3,095,041					873,248	873,248	8		637,437	632,637	8		1,589,156
West Virginia	2,677,937													2,677,937
Wisconsin	5,022,683					577,061	520,134	7		875,751	834,582	6		3,667,967
Wyoming	1,360,841					55,366	55,365	2						1,305,476
District of Columbia	410,804									166,697	166,697	2		244,107
Hawaii	453,703									113,769	113,769	1		339,934
TOTALS	196,000,000					16,428,392	16,185,763	185		36,203,324	34,971,870	455	2	144,842,367

PUBLICATIONS of the BUREAU OF PUBLIC ROADS

Any of the following publications may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. As his office is not connected with the Department and as the Department does not sell publications, please send no remittance to the United States Department of Agriculture.

ANNUAL REPORTS

Report of the Chief of the Bureau of Public Roads, 1924. 5 cents.

Report of the Chief of the Bureau of Public Roads, 1927. 5 cents.

Report of the Chief of the Bureau of Public Roads, 1928. 5 cents.

Report of the Chief of the Bureau of Public Roads, 1929. 10 cents.

Report of the Chief of the Bureau of Public Roads, 1931. 10 cents.

Report of the Chief of the Bureau of Public Roads, 1932. 10 cents.

Report of the Chief of the Bureau of Public Roads, 1933.

Report of the Chief of the Bureau of Public Roads, 1934.

DEPARTMENT BULLETINS

No. 136D . . Highway Bonds. 20 cents.

No. 347D . . Methods for the Determination of the Physical Properties of Road-Building Rock. 10 cents.

No. 583D . . Reports on Experimental Convict Road Camp. Fulton County, Ga. 25 cents.

No. 1279D . . Rural Highway Mileage, Income, and Expenditures, 1921 and 1922.

TECHNICAL BULLETINS

No. 55T . . Highway Bridge Surveys. 20 cents.

No. 265T . . Electrical Equipment on Movable Bridges. 35 cents.

MISCELLANEOUS CIRCULARS

No. 62MC . . Standards Governing Plans, Specifications, Contract Forms, and Estimates for Federal-Aid Highway Projects. 5 cents.

MISCELLANEOUS PUBLICATIONS

No. 76MP . . The Results of Physical Tests of Road-Building Rock. 25 cents.

Federal Legislation and Regulations Relating to Highway Construction. 10 cents.

Supplement No. 1 to Federal Legislation and Regulations Relating to Highway Construction.

No. 191 . . . . Roadside Improvement. 10 cents.

The Taxation of Motor Vehicles in 1932. 35 cents.

Single copies of the following publications may be obtained from the Bureau of Public Roads upon request. They cannot be purchased from the Superintendent of Documents.

SEPARATE REPRINT FROM THE YEARBOOK

No. 1036Y . . Road Work on Farm Outlets Needs Skill and Right Equipment.

TRANSPORTATION SURVEY REPORTS

Report of a Survey of Transportation on the State Highway System of Ohio (1927).

Report of a Survey of Transportation on the State Highways of Vermont (1927).

Report of a Survey of Transportation on the State Highways of New Hampshire (1927).

Report of a Plan of Highway Improvement in the Regional Area of Cleveland, Ohio (1928).

Report of a Survey of Transportation on the State Highways of Pennsylvania (1928).

Report of a Survey of Traffic on the Federal-Aid Highway Systems of Eleven Western States (1930).

A complete list of the publications of the Bureau of Public Roads, classified according to subject and including the more important articles in PUBLIC ROADS, may be obtained upon request addressed to the U. S. Bureau of Public Roads, Willard Building, Washington, D. C.

CURRENT STATUS OF UNITED STATES PUBLIC WORKS ROAD CONSTRUCTION

AS PROVIDED BY SECTION 204 OF THE NATIONAL INDUSTRIAL RECOVERY ACT (1934 FUNDS) AND BY THE ACT OF JUNE 18, 1934 (1935 FUNDS)

AS OF DECEMBER 31,1935

STATE	APPORTIONMENTS		COMPLETED				UNDER CONSTRUCTION				APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS	
	Sec. 204 of the Act of June 16, 1933 (1934 Fund)	Act of June 18, 1934 (1935 Fund)	Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	Estimated Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds
Alabama	$ 8,370,133	$ 4,259,842	$ 12,979,571	$ 7,729,095	$ 2,089,448	682.8	$ 1,947,736	$ 582,710	$ 1,208,067	78.8		$ 397,253	13.0	$ 58,328	$ 565,074
Arizona	5,211,960	2,641,935	8,063,687	5,061,654	2,023,015	523.0	752,811	134,249	507,347	22.3		41,125	.5	16,057	70,448
Arkansas	6,748,335	3,428,049	9,644,999	6,421,999	2,260,117	530.4	1,116,949	164,431	949,864	71.9	$ 101,076	48,836	3.8	60,829	169,231
California	15,607,354	7,932,206	25,538,846	15,123,463	5,246,703	736.9	4,670,717	478,067	2,445,654	36.1		178,186	.7	5,824	61,663
Colorado	6,874,530	3,486,006	11,037,202	6,831,431	3,362,522	637.2	95,116		95,116	.6				43,099	28,368
Connecticut	2,865,740	1,454,868	4,215,522	2,859,411	941,105	69.3	359,166		343,645	3.7		58,859	.1	6,329	111,258
Delaware	1,819,088	923,395	2,644,057	1,818,961	775,652	129.3	42,012		42,012					126	105,731
Florida	5,231,834	2,661,343	8,129,789	5,182,694	1,756,426	275.0	709,012		627,057	32.3		178,968	1.7	49,140	98,892
Georgia	10,091,185	5,113,491	11,626,646	8,987,193	2,222,207	659.0	1,571,497	674,778	848,696	76.6	19,197	396,797	15.3	410,018	1,645,791
Idaho	4,486,249	2,277,486	6,221,202	4,395,105	1,450,600	488.8	657,458		656,209	8.5		56,567	2.8	91,144	114,111
Illinois	17,570,770	8,921,401	19,882,761	15,198,894	4,188,580	553.3	6,176,164	2,301,004	3,875,160	141.0		590,781	.5	70,873	266,879
Indiana	10,037,843	5,088,963	11,540,160	9,065,834	1,990,004	363.1	3,548,907	791,499	2,722,015	123.3	58,342	192,513	2.2	122,168	184,431
Iowa	10,055,660	5,118,361	15,304,534	9,883,155	4,630,491	1,212.2	428,888	170,404	230,700	12.9		1,000	2.2	2,101	256,170
Kansas	10,089,604	5,117,675	13,815,683	9,996,448	3,427,982	1,065.4	1,709,922	39,153	1,670,769	76.1	48,982	14,934	2.2	5,022	3,990
Kentucky	7,517,359	3,818,311	10,043,766	6,981,980	2,424,368	738.8	1,590,289	432,327	1,042,672	66.1	55,381	152,252	7.9	47,671	199,019
Louisiana	5,828,591	2,963,932	6,444,550	4,581,839	1,300,725	195.2	2,323,957	1,041,640	1,240,364	47.6	155,417	376,293	17.1	49,695	46,551
Maine	3,369,917	1,711,586	4,920,427	3,346,776	1,369,575	184.8	286,379		286,364	8.3				23,141	55,647
Maryland	3,564,527	1,810,058	4,277,424	2,778,170	600,931	113.6	1,168,010	716,844	438,995	32.8		162,409	4.9	69,512	607,723
Massachusetts	6,597,100	3,350,474	6,823,769	4,587,714	1,650,167	102.9	3,374,357	1,974,333	1,400,024	12.4				35,053	300,283
Michigan	12,736,227	6,452,568	17,524,881	12,550,953	4,042,853	654.8	2,523,502	117,227	2,348,297	114.1		30,825	.1	68,048	30,592
Minnesota	10,656,569	5,425,551	15,380,467	9,885,007	4,787,931	1,623.5	842,952	615,120	188,795	26.3	17,260	183,253	2.0	139,182	265,572
Mississippi	6,978,675	3,540,227	9,780,654	5,827,706	1,371,564	563.7	2,967,830	1,001,411	1,649,097	156.8	7,259	418,474	22.9	142,299	101,091
Missouri	12,180,306	6,173,740	14,550,617	10,867,588	2,745,086	1,321.5	4,425,522	1,185,562	3,127,490	129.2		240,598	.6	127,156	60,567
Montana	7,439,748	3,769,734	11,039,598	7,184,779	3,217,640	1,001.2	605,546	159,632	445,914	29.7				95,337	106,180
Nebraska	7,828,961	3,964,364	12,397,483	7,752,426	3,395,846	991.9	731,069	34,040	462,677	42.0				42,494	105,842
Nevada	4,545,917	2,302,356	6,641,677	4,502,450	1,984,444	735.6	359,003	26,150	296,747	21.7		1,650		17,317	19,514
New Hampshire	1,909,839	969,462	2,941,750	1,909,443	915,667	77.2	30,238		30,238	.5				396	23,558
New Jersey	6,346,039	3,220,879	6,960,279	6,014,766	588,610	75.6	2,636,867	175,941	2,143,993	12.6				155,332	488,276
New Mexico	5,792,935	2,941,700	8,184,716	5,634,473	2,370,444	747.6	439,280		439,280	19.7	114			158,348	131,976
New York	22,330,101	11,327,921	36,135,115	21,673,218	8,347,852	788.4	3,767,593	414,900	2,394,899	35.0	129,549	514,400	2.0	112,434	70,770
North Carolina	9,522,293	4,840,941	13,984,680	8,830,611	3,935,293	1,322.4	937,889	320,633	600,361	22.0	64,450	212,350	4.3	306,599	92,937
North Dakota	5,804,448	2,938,967	7,321,364	5,518,203	1,157,590	1,949.5	748,802	130,778	559,429	112.3	67,289	492,657	60.7	88,178	729,291
Ohio	15,484,592	7,865,012	22,259,969	15,279,029	5,375,622	743.2	2,279,516	161,431	1,920,916	32.4		335,658	13.3	44,132	232,816
Oklahoma	9,216,798	4,685,180	12,635,607	8,874,279	2,931,136	753.2	1,587,592	323,398	1,262,459	49.8		178,597	1.1	19,121	312,988
Oregon	6,106,896	3,097,814	9,380,531	5,897,458	2,673,854	461.4	435,492	99,557	264,264	4.0				109,880	159,696
Pennsylvania	18,891,004	9,590,788	27,103,393	17,875,517	8,021,122	993.9	1,741,489	763,474	891,968	85.7	5,126	307,671	2.1	245,886	370,026
Rhode Island	1,998,708	1,014,572	2,959,600	1,994,413	853,971	88.0	138,587		137,102	1.1		880		4,295	22,619
South Carolina	5,459,165	2,770,954	5,929,981	4,953,067	859,933	458.3	1,861,400	367,719	1,455,359	159.9	15,740	53,304	.3	122,639	402,358
South Dakota	6,011,479	3,047,643	8,494,583	5,777,253	2,168,397	1,463.3	446,595	17,045	428,550	57.6	62,646	371,065	31.6	154,534	79,632
Tennessee	8,492,619	4,302,991	11,690,366	8,180,321	2,641,483	453.1	1,491,399	225,333	1,169,665	30.0	83,206	185,008	2.8	3,760	306,835
Texas	24,244,024	12,291,253	32,487,212	23,386,605	7,595,530	2,598.9	5,494,572	821,696	4,425,689	176.7	1,537	148,932	16.7	34,187	121,102
Utah	4,194,708	2,132,691	6,583,011	4,000,360	1,807,147	579.6	613,128	167,060	322,191	11.4		1,000		27,288	2,353
Vermont	1,867,573	948,007	3,035,765	1,846,336	849,229	137.6	109,059	3,922	90,873	2.4		2,713		17,315	5,132
Virginia	7,416,757	3,765,387	10,976,790	7,161,309	2,910,118	555.3	746,004	131,402	602,187	62.1	42,221	45,681	.8	81,825	207,401
Washington	6,115,867	3,106,412	8,843,000	6,101,000	2,527,319	299.5	524,373		518,276	3.3		4,691		14,867	56,125
West Virginia	4,474,234	2,280,335	5,864,100	4,167,184	928,672	182.6	1,259,030	268,494	938,583	35.8	5,987	3,000	.1	32,569	410,081
Wisconsin	9,724,881	4,941,837	14,867,069	9,639,754	4,340,950	605.0	584,701	7,300	534,958	15.4		51,605		77,827	14,325
Wyoming	4,501,327	2,287,712	6,564,177	4,441,334	1,933,314	987.8	359,722	46,705	286,281	43.5		60,239		13,288	7,879
District of Columbia	1,916,469	973,842	2,530,169	1,918,173	611,996	18.8	75,066		75,066	1.4		250,876	2.2	296	35,904
Hawaii	1,871,062	949,778	1,504,948	1,130,620		32.2	1,407,934	700,733	534,135	19.0	39,709	169,484	2.0		246,158
TOTALS	394,000,000	200,000,000	549,098,153	371,608,451	131,601,231	32,525.6	74,700,099	17,788,102	51,176,469	2,370.7	980,488	7,111,384	240.5	3,622,959	10,110,916

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